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MINERALS YEARBOOK

Area Reports: International 2004

Asia and the Pacific

Volume III

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U.S. Department of the Interior
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MINERALS YEARBOOK

Area Reports: International 2004

Asia and the Pacific

Volume III

U.S. DEPARTMENT OF THE INTERIOR
DIRK KEMPTHORNE, Secretary

U.S. GEOLOGICAL SURVEY
Mark D. Myers, Director

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 2006

Published in the Eastern Region, Reston, Va.
Manuscript approved for publication November 30, 2006.

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For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512-1800; DC area (202) 512-1800
Fax: (202) 512-2104 Mail: Stop IDCC, Washington, DC 20402-0001

ISBN 0–16–077710-0

Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industries during 2004 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Mark D. Myers, Director

Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the World Wide Web at URL http://www.usgs.gov or by contacting the Earth Science Information Center at 1-888-ASK-USGS. For specific information about this publication, contact the Chief, International Minerals Section, Minerals Information Team, at (703) 648-7732, or the Team secretary at (703) 648-4961. Additional minerals information may be accessed on the World Wide Web at URL http://minerals.usgs.gov/minerals.

Acknowledgments

The Country Specialists in the Minerals Information Team, U.S. Geological Survey, in preparing the International Review regional books of volume III of the Minerals Yearbook, extensively use statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations are gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, United Nations publications, and the domestic and foreign technical and trade press. Of particular assistance were reports submitted by the Resource Reporting Officers and other officers of the Department of State in U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support was provided by the staff of the Data Collection and Coordination Section of the Minerals Information Team.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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THE MINERAL INDUSTRIES OF ASIA AND THE PACIFIC

By Yolanda Fong-Sam, Chin S. Kuo, Travis Q. Lyday, Pui-Kwan Tse, David R.Wilburn, and John C. Wu

The Asia and the Pacific region, which includes 31 countries and territories, has a total area of about 29.9 million square kilometers. The total population in 2004 was about 3.55 billion, which accounted for about 56% of the world total. China and India, which were the world's two most populous countries, accounted for 67% of the region's total population and about 37% of the world's total population. China's and Japan's economies ranked in the top five in the world. The economies of China, India, and Mongolia were the fastest growing in the region in 2004 (tables 1, 2).

Australia and China were among the world's leading mineral producers. Australia has large resources of bauxite, coal, cobalt, copper, diamond, gold, iron ore, lead, lithium, manganese, mineral sands, nickel, silver, tantalum, uranium, and zinc. China has large resources of antimony, arsenic, barite, coal, copper, fluorite, gold, graphite, iron ore, magnesium, mineral sands, rare earths, silver, strontium, tin, tungsten, and zinc. India also was one of the world's significant mineral producers and has large resources of barite, bauxite, chromium, iron ore, manganese, rare earths, and salt. Other significant mineral producers in the region were Indonesia, which has large resources of coal, copper, gold, nickel, and tin; Mongolia, which has large resources of copper, fluorspar, and molybdenum; Papua New Guinea, which has large resources of copper and gold; the Philippines, which has large resources of copper, gold and nickel; and Thailand, which has large resources of feldspar, gypsum, and potash.

Despite the large amount and wide variety of regional resources of nonfuel minerals and mineral fuels in Australia, China, India, Indonesia, Mongolia, Papua New Guinea, the Philippines, and Thailand, the regional supplies of numerous nonfuel minerals [including aluminum, bauxite, copper, gold, diamond, iron ore, lead, platinum-group metals (PGM), phosphate rock, silver, and zinc] and such major mineral fuels as coal, natural gas, crude petroleum, and refined petroleum products were insufficient to satisfy the demand in the region. The situation was caused largely by a substantial increase in consumption of nonfuel minerals and mineral fuels by China and India; by such resource-poor industrialized countries as Japan, Hong Kong, the Republic of Korea, Singapore, and Taiwan; and by the growing economies of such middle-income developing countries as Indonesia, Malaysia, and Thailand. The Middle Eastern and North American regions supplied a large percentage of the Asia and the Pacific region's requirements for natural gas, crude petroleum, and refined petroleum products. Africa, North America, and South America supplied a substantial percentage of the region's raw material requirements for ferrous and nonferrous metals.

China and Japan were the two major regional markets for crude and processed minerals. Japan was the region's leading consumer of ferrous and nonferrous metals because of its large manufacturing sector and its poor indigenous resources. China, however, remained the region's strongest consumer in terms of growth in demand, especially for such mineral commodities as aluminum, cement, coal, copper, iron and steel, lead, natural gas, crude petroleum, tin, and zinc. India, Indonesia, the Republic of Korea, Malaysia, Singapore, Taiwan, Thailand, and Vietnam also were important consumers of such mineral commodities as aluminum, cement, copper, gold, iron ore, lead, phosphate rock, silver, steel, and zinc.

Acknowledgments

The U.S. Geological Survey (USGS) acknowledges and thanks the following foreign Government agencies, international institutions, and private research organizations for providing mineral-production statistics, basic economic data, and exploration and mineral-related information:

For mineral production statistics:

- Australia—Australian Bureau of Agricultural and Resources Economics and Western Australia Department of Minerals and Petroleum Resources;
- Brunei—Prime Minister's Department, Petroleum Units;
- Cambodia—Ministry of Industry, Mines and Energy, Department of Mineral Resources Development;
- India—Indian Bureau of Mines;
- Japan—Ministry of Economy, Trade and Industry, Research and Statistics Department;
- Laos—Ministry of Industry and Handicraft, Department of Geology and Mines;
- Malaysia—Ministry of Primary Industry, Minerals and Geoscience Department;
- Mongolia—Mineral Resources and Petroleum Authority;
- Republic of Korea—Korea Institute of Geoscience and Mineral Resources; and
- Thailand—Ministry of Industry, Department of Primary Industries and Mines.

For key economic data:

- Asian Development Bank in Manila, the Philippines;
- International Monetary Fund in Washington, DC; and
- The World Bank in Washington, DC.

For exploration and other mineral-related information:

- Australian Bureau of Statistics in Canberra, Australia; and
- Metals Economics Group in Halifax, Nova Scotia, Canada.

General Economic Conditions

Despite the adverse affects of higher energy prices, the economies of the Asia and the Pacific region remained strong. The region's aggregate real gross domestic product

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[1] References that include a section mark (§) are found in the Internet References Cited section.

(GDP) expanded by about 7% in 2004. Except for the Pacific developing countries, nearly all developing Asian countries posted more than 5% in the growth GDP. The growth of economies of the region benefited from the robust growth in major industrial countries, especially the United States. Revival of business investment was the main engine for economic growth in the region, particularly in East Asia and Southeast Asia where, except in China, it had been lagging since the Asian financial crisis in 1997; in China, investment remained high during the past decade. Of the 31 countries and territories in the region, Japan ranked the richest in terms of its per capita GDP, and East Timor was the poorest. China ranked as the region's largest economy in terms of total GDP based on purchasing power parity followed by Japan, India, the Republic of Korea, Indonesia, and Australia (table 2).

The economies of the developing Asian countries were expected to continue to perform better than the developed and newly industrialized Asian countries. The economic growth in the Asia and the Pacific region was expected to be higher than in other regions in the world. According to the Asian Development Bank, the economic growth in the Asia and the Pacific region was projected to be between 6.5% and 6.9% (7.1% and 7.5% on the basis of purchasing power parity). The economic growth of East Asia was projected to be between 6.7% and 7.2% for the next several years, which was the fastest within the region. The Pacific area was project to be the slowest, with a projected growth rate of between 1.4% and 2.3% (Asian Development Bank, 2005, p. 4). Japan is the world's second largest economy behind the United States. Japan's economy had recovered completely and domestic demand grew solidly in 2004. An improving Japanese economy could create more investment opportunities domestically and would likely benefit China, Indonesia, the Republic of Korea, Taiwan, and Thailand, which export their products to Japan. Japan has been a key investor in many countries in Asia. The Japan's shares of investment, which accounted for 30% of Thailand's the total foreign direct investment; 25%, the Philippines, and 16%, the Republic of Korea,.

Despite the tightened policies introduced in 2004, China's economy was expected to continue to grow at annual rate of about 8% until 2010. Consumption was picking up slowly but steadily, and investment was concentrated more in sectors with bottleneck problems, such as energy and transportation infrastructure, during the year. South Asia's economic growth was projected to be about 6% per year. India's economic growth was projected to grow at an average of 7% per year into 2007; the industry and service sectors were expected to be the main engines for this growth. The Indian Government planned to increase funding for infrastructure investment, but this increase may be constrained by large budget deficits on the part of the Federal and State Governments (Citigroup Global Market Inc., 2005, p. 60).

Investment Interest and Political Risk

China continued to invest heavily in expanding its mineral industry's production capacity, especially of aluminum, cement, copper, and iron and steel. To prevent duplicate investment and nonperforming loan problems and to maintain China's financial stability, the Ministry of Land and Resources froze the supply of land for building villas, and the Chinese Central Bank raised the required reserves ratio on commercial banks to 7% from 6%. The Government issued a circular to commercial banks to curb credit and expansion investment projects related to the aluminum, cement, and iron and steel sectors. The State Council raised the lending criteria for aluminum, cement, and steel projects by requiring more equity investment.

In 2004, investment in Mongolia was focused mainly on copper and gold. The privately owned Ivanhoe Mines Ltd. of Canada and the state-owned China International Trust & Investment Corp. of China agreed to form a strategic alliance (joint venture) for mineral exploration, development, and production projects. In 2004, Ivanhoe completed the feasibility study for the development of two gold-rich open pit copper mines at Oyu Tolgoi in Umnogovi Aimag in the southern Gobi area. The initial capital investment of about $530 million would be spent for the first stage of the project during which between 300,000 and 400,000 metric tons per year (t/yr) of copper concentrates and 12.5 t/yr of gold would be produced.

The Indian Government changed its investment policy to allow private sector participation in exploration and exploitation of the mineral sector. The policy changes attracted multinational companies to participate in exploration for base metals and other minerals. As of December 2004, 73 foreign investment projects worth $900 million were submitted for Government approval. The Government also abolished limits on private oil exploration and marketing companies.

In the Republic of Korea, Pohang Iron and Steel Co. Ltd. signed a contract with Voest-Alpine Industrieanlagenbau of Austria to build a $44 million FINEX plant at the Pohang site. FINEX is an environmentally friendly ironmaking technology. FINEX simplifies the ironmaking process by direct application of fine iron ore. The first commercial-scale FINEX ironmaking plant in the Republic of Korea was scheduled to begin operations by the end of 2006.

In Burma, China Nonferrous Metal Mining and Construction Co. Ltd. and Burma's Mining Enterprise No. 3 signed an agreement for mineral exploration in northern Thabeikkyin Township in Burma, which is located about 130 kilometers from the southeastern border of Yunnan Province (China). In Malaysia, Cahya Mata Sarwak Bhd of Malaysia and China's China Hydro Corp. and Shandong Luneng Group signed a memorandum of understanding to jointly build a 500,000-t/yr aluminum smelter in Sarawak. In Laos, Oxiana Ltd. of Australia invested $330 million and Pan Australian Resources N.L. of Australia invested $165 million for exploration and development of copper and gold projects in Laos. In Vietnam, Tiberon Minerals Ltd. of Canada was expected to invest about $140 million during the next 2 to 3 years for the development of a tungsten-fluorite mine at the Nui Phao deposit.

Legislation

To attract foreign investment in mineral development and production in China, the Government urged the National People's Congress to amend the mineral resources law, which had been enacted in 1986 and amended previously in 1996. Under this law, prospectors have mining rights, but how such rights can be guaranteed is not explained clearly. In 2003, the Ministry of Land and Resources established a mineral resources law consultant committee to seek recommendations from domestic and overseas mining law experts on the proposed redefinition of mineral rights.

In India, the Government reduced the basic tariff on imported metallurgical coke to 5% from 15% and abolished the tariff on metallurgical coke imported from China. The Government also reduced import traiffs on polished diamond and gemstones to 5% from 15% and reduced the custom duty on gold bars and coins to $2.10 per 10 grams in 2003 from $5.25 per 10 grams in 2002. In the Republic of Korea, the Government had reduced the import tariff on such raw materials as coal and ore and concentrates of copper, iron, lead, manganese, titanium, and zinc and on such processed minerals as primary aluminum, refined copper, nickel oxide, and pig iron.

In Indonesia, the drafting of a proposed new mining law was completed by the Ministry of Energy and Resources (MER) and submitted to the State Secretariat for approval before submission to the House of Representatives to be legislated into law. The new mining law would replace General Mining Law No. 11/1967. The replacement was considered to be necessary because the old law was not compatible with conditions in the mining sector.

In Mongolia, the Parliament had approved amendments to the Law of Corporate Income Tax. The corporate income tax ceiling under the amendment was to be reduced to 30% from 40% effective January 1, 2004. Various tax incentives for foreign investment companies, however, would be terminated. The Government submitted a proposed amendment to the Parliament in December 2003 that would abolish the 10% value-added tax on gold sales and change the royalty for extraction of hard-rock mineral deposits to 2.5%, and of placer gold deposits, to 7.5%. In Sri Lanka, the Parliament approved the Petroleum Resources Bill, which allows the private sector to invest in oil and gas exploration to exploit the country's petroleum resources and to share profits with foreign and local companies.

Exploration

Exploration activity in much of the Asia and the Pacific region increased in 2004 from the 2003 levels. Data derived from the Metals Economics Group (MEG) annual survey suggest that the 2004 proposed budget allocations for Australian exploration activity of about $522 million was 54% higher than the $339 million reported by MEG in its 2003 survey. Similarly, the 2004 budget for the Pacific region countries (excluding Australia) of about $156 million was about 68% higher than the corresponding 2003 budget. The estimate for the exploration budget for mainland Asia was reported to be $204 million in 2004 by MEG, which was up by about 140% from the $84 million reported for 2003 (Metals Economics Group, 2004a, b).

Although the MEG estimates of recent Australian mineral exploration activity showed an increase in 2004, Australian activity has generally declined since 1997. The MEG estimate for the 2004 Australian exploration budget allocation declined to 14.7% of the total world exploration budget in 2004 from 15.5% in 2003 and 17.6% in 2002. The Australian Bureau of Agricultural and Resource Economics (ABARE) reported minerals exploration expenditures for the fiscal 2004-05 year to be $1.40 billion, as compiled by the Australian Bureau of Statistics; the exploration expenditure on petroleum was $735 billion; gold; $274 million; base metals, $183 million; and others, $208 million (Australian Bureau of Agricultural and Resource Economics, 2005).

The Australian states and territories that experienced the highest levels of exploration activity in 2004 were, in descending order based on the number of sites, Western Australia (57%), South Australia (12%), Queensland, (10%), and New South Wales (10%). South Australia saw gains in 2004 as a result of extensive work conducted on the Prominent Hill copper/gold project. Several Western Australian projects increased their identified resources as a result of drilling programs conducted in 2004.

The Australian Government issued a report in 2004 that outlined its strategy to stimulate mineral exploration in Australia. The report titled "the Road to Discovery: the Minerals Exploration Action Agenda," discusses measures planned to address impediments to resource exploration, including issues related to the labor pool, land access, minerals data availability and quality, and native title issues (Mining Journal, 2004a). The Minerals Council of Australia released an update to the public reporting standards contained in the Australian Code for Reporting of Exploration Results, Mineral Resources, and Ore Reserves (Mining Journal, 2004b).

Native title claims issues continue to affect Australian exploration and mining. A series of templates for native title agreements was developed by the Victoria Minerals and Energy Council as a means of simplifying the native title process (MineBox, 2004b§[1]). Agreements among the Western Australia Government, the mining industry, and native title claimants were signed in 2004 to speed up the native title process by establishing a mutually-agreed-upon heritage-protection process (MineBox, 2004c§). An $8.8 million 4-year program of airborne geophysical surveys was implemented in Western Australia during 2004 (MineBox, 2004d§).

Based on MEG data, the 2004 exploration budget allocation for the Pacific region and Southeast Asia was about $156 million, which was up in dollar terms from the 2003 level of $93 million and up to 4.4% of the world exploration budget compared with the 4.2% share reported for 2003. Growth in this region remained somewhat muted amidst uncertainty of tenure and continued political and social unrest (Metals Economics Group, 2004b). A significant portion of the interest was focused on later-stage projects, which accounted for about 39% of all exploration, based on the U.S. Geological Survey site information. Projects that received significant activity included expansion of copper-gold reserves in the Grasberg area (Indonesia), drilling at Penjom (Malaysia), extension of the Fraser zone at Macres (New Zealand), and feasibility work at the Ban Phuc base metals-deposit in Vietnam.

The Indonesian Government issued a regulatory decree that allows 13 mining companies that have previously reported economically viable mineral reserves to resume exploration or mining activities in protected forested areas. This regulation does not replace a 1999 law that banned mining in protected forests, so any future mineral exploration not specifically covered in this decree would continue to be prohibited (Mineweb, 2004§). The Supreme Court of the Republic of the Philippines revoked the country's system of financial or technical assistance agreements that were designed to allow full foreign ownership in mining projects with a capital cost of more than $50 million (Mining Journal, 2004d).

Within mainland Asia, base-metals and gold exploration was focused on China and Mongolia in 2004. These two countries combined accounted for about 91% of mineral exploration within the region. MEG estimates suggest that about $100 million was budgeted for Mongolia in 2004, which was up from the $25 million budgeted in 2003; similarly, MEG estimated that the 2004 mineral exploration in China was about $86 million, which was up from $21 million in 2003 (Cox and Goulden, 2005§).

Mineral exploration in China has increased since the country opened its mining sector to foreign investment during the 1990s. The gold sector in China is being restructured to separate operational functions of the Government from regulatory functions. Technological improvements in the Chinese gold mining industry, regulations encouraging foreign investment, and the establishment of publicly-listed gold companies are making it easier for both Chinese and foreign companies to conduct business in China. A total of 2,693 exploration and mining licenses were issued between January and June 2003 compared with 1,794 exploration licenses in 2002 (Anser Enterprises Corporation, 2005).

China continued to reform its mining sector. The China State Council released a white paper in December 2003 that summarized its plans and progress toward updating its mining regulatory regime. A revision of the Mineral Resources Law was being prepared and was expected to be adopted within 4 to 5 years (Kwauk, 2004). In India, the Confederation of Indian Industry's Eastern region commissioned a 3-year study to assess the mineral potential of the region (Mining Journal, 2004c).

Interest in mineral exploration in Mongolia in 2004 was in large part driven by the exploration activity of Ivanhoe Mines Limited at its Turquoise Hill (Oyu Tolgai) copper-gold project. MEG reports that the company allocated $78 million for exploration projects in Mongolia, which accounted for 79% of the MEG estimate for total 2004 mineral exploration expenditures for Mongolia (Metals Economics Group, 2004b). Interest in exploring other countries of South Asia, notably India and Pakistan, has also increased.

Commodity Overview

Estimates for production of major mineral commodities for 2007 and beyond have been based upon supply-side assumptions, such as announced plans for increased production/new capacity construction and bankable feasibility studies. The outlook tables in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the data are estimated or reported and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current (2004) producing facilities and on planned new facilities that operating companies, consortia, or Governments have projected to come online within indicated timeframes. Forward-looking information, which includes estimates of future production, exploration and mine development, cost of capital projects, and timing of the start of operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will occur.

Metals

Aluminum and Bauxite and Alumina.—The region's production of bauxite accounted for about 49% of the world total in 2004. Australia, which was the world's leading producer of bauxite, accounted for 30% of the world total; it was followed by China, 10%, and India, 8%. Production of aluminum accounted for about 33% of the world total in 2004. China, which was the world's leading producer of aluminum, accounted for about 20% of the world total; it was followed by Australia, 6%, Japan, 3%; and India, 2% (table 4).

Regional production of primary aluminum and bauxite was expected to continue to grow at an average annual rate of about 8% and 8%, respectively, between 2004 and 2011 (tables 5, 6). This prediction was based on reported capacity expansions in Australia, China, India, and Vietnam. Regional production of secondary aluminum was predicted to increase to 1.6 million metric tons per year (Mt/yr) in 2011 with a slight decrease in estimated production in Japan and a gradual increase in estimated production in China (table 7).

In Australia, alumina capacity expansions included the construction of a 1.4-Mt/yr refinery by Comalco Ltd. at Gladstone, Queensland; a 600,000-metric-ton-per year (t/yr) refinery at Pinjarra; and a 250,000-t/yr refinery at Worsley. In China, several companies either began or planned construction of alumina refineries in the Provinces of Guangxi, Henan, Shandong, and Shanxi. Aluminum Corporation of China Co. Ltd. (Chalco), the Xinzhou City Government, and the Luneng Group formed a joint venture, Luneng Jinbei Aluminum Industry Co. Ltd., to build a 2-Mt/yr refinery. Chalco, Bosai Aluminum Co., and others jointly built an 800,000-t/yr refinery in Chongqing City. The East Hope Group's 1.05-Mt/yr refinery was under construction in Minchi, Henan Province. Xinan Aluminum Co.'s 800,000-t/yr refinery at Xinan, Henan Province, was scheduled to be commissioned in 2005. Baofeng Aluminum Co. and Shenhuo Group planned to build a 1.05-Mt/yr refinery at Baofeng, Henan. The Shandong Nanshan Group planned to build a 1-Mt/yr refinery at Longkou, Shandong Province. In the State of Orissa in India, capacity expansions included the ongoing expansions of a bauxite mine and an alumina refinery to 4.8 Mt/yr and 1.6 Mt/yr, respectively, at Dhamanjodi; an aluminum smelter to 525,000 t/yr at Angul by National Aluminium Co. Ltd.; and an aluminum smelter to

57,200 t/yr from 30,000 t/yr by Indian Aluminium Co. Ltd. at Hirakud. Vedanta Resources plc started construction of a 1.4-Mt/yr refinery and was scheduled to complete it in 2007; the company was also considering building an aluminum smelter in Orissa.

Copper.—The region's production of mined copper accounted for about 17% of the world total in 2004. Indonesia, which was the leading regional producer, was followed by Australia and China. Production of primary refined copper metal accounted for about 31% of the world total primary refined copper production in 2004. Among the region's refined copper producers, China was the world's second ranked producer of primary and secondary refined copper metal, and Japan ranked third. Australia and the Republic of Korea also were important producers of refined copper metal in the world (table 4).

Japan was one of the world's major import markets for copper concentrates. The country imported more than 4 Mt of copper concentrates annually. China was also a major importer of copper concentrates and refined copper. China imported about 2.9 Mt of copper concentrates and about 1.4 Mt of refined copper. China and Japan accounted for about 50% of copper concentrates traded in the world. Other important consumers of copper concentrates in the region were India and the Republic of Korea, which imported about 1.3 Mt of copper concentrates each. Australia, Indonesia, Mongolia, and Papua New Guinea were the major regional suppliers of copper concentrates to China, Japan, and the Republic of Korea. Japan, Indonesia, and the Philippines were the region's major suppliers of refined copper to China and other Southeast Asian countries.

Between 2004 and 2011, regional production of refined copper metal and mined copper was expected to continue to increase at an average annual rate of about 6% and 7%, respectively,. This prediction was based on reported capacity expansions of mined copper in Australia and Indonesia, as well as Burma, Laos, Thailand, and Vietnam, and on reported capacity expansions of refined copper metal in China and Japan, as well as Burma, Laos, Thailand, and Vietnam (tables 8, 9).

In Australia, mine production was expected to increase because of higher output from the Tritton copper mine, which is owned by Tritton Resources, and Telfer gold/copper mine, which is owned by Newcrest Mining Ltd. In Indonesia, gradual capacity expansions were to be undertaken by P.T. Freeport Indonesia Co. at Grasberg, Province of Papua, and by P.T. Newmont Nusa Tenggara at Batu Hijau on Sunbawa Island, Province of West Nusa Tenggara. In China, Jiangxi Copper Co. Ltd. planned to expand the mining and processing output capacity at the Wujiawu, the Wushan, and the Yinshan Mines. For refined copper, China's Jiangxi Copper planned to increase its refining capacity to 700,000 t/yr in 2007 from 400,000 t/yr in 2004 at Guixi, Province of Jiangxi, and Yunnan Copper Group Co. Ltd. planned to increase its refinery capacity to 350,000 t/yr from 160,000 t/yr at Kunming, Province of Yunnan, by 2005. Tongling Nonferrous Metals Co. planned to expand its copper refining capacity to 450,000 t/yr from 310,000 t/yr in the next 3 years. In Japan, Sumitomo Metal Mining Co. Ltd. planned to gradually expand the capacity of its Toyo Smelter and Refinery to 450,000 t/yr by 2008. In Burma, Myanmar Ivanhoe Copper Co. Ltd. planned to develop the Letpadaung deposit in the Monywa area and to increase its capacity to 125,500 t/yr of copper cathodes from 25,000 t/yr in five stages between 2005 and 2009. In Laos, Oxiana Ltd. of Australia planned to develop a copper mine and to build a processing plant at the Khanong deposit to produce 60,000 t/yr of copper cathodes by 2006. In Thailand, Pan Australian Resources N.L. of Australia, in joint venture with Padaeng Industry Public Co. of Thailand, planned to develop a copper mine and to build a processing plant at their PUT 1 deposit, which could begin operations at the capacity of 30,000 t/yr of copper cathodes by 2008. Thai Copper Industries PLC planned to commission its new 165,000-t/yr copper smelter and refinery in Rayong by mid-2004. In Vietnam, Vietnam National Minerals Corp. began construction work on a copper mine and smelter at Sin Queyen, Province of Lao Cai, to produce 42,000 t/yr of copper concentrate and 10,500 t/yr of refined copper by 2006.

Gold.—The region's production of mined gold accounted for about 30% of the world total in 2004. Australia was the leading mined-gold-producing country in the region, followed by China and Indonesia. The region's production of mined gold increased by 68% between 1990 and 2000 and decreased slightly by about 0.5% between 2000 and 2004 mainly because of the decline in output from Australia, Indonesia, and Papua New Guinea (table 10).

Australian gold production was expected to grow only slightly in the next few of years. The output of a number of Australia's large gold mine operations, such as AngloGold Ashanti's Sunrise Dam, Goldfield's St. Ives, and Newmont's Kalgoorlie and Tanami, was forecast to decline because of low ore grades. The decline of these operations was offset by the planned opening of a number of operations such as Ballarat Goldfields' Ballarat East in Victoria, and BMA Gold's Twin Hills and Citigold's Warrior in Queensland, which were expected to begin operation within the next couple of years. In 2004, China's production of mined gold reached a record high of more than 200 metric tons (t); that of Indonesia declined because of low ore grade from Freeport's Grasberg mine, although production was expected to rebound in the next several years. Owing to development of the Boroo mine, Mongolia's production of mined gold increased sharply. Production of mined gold in Japan, New Zealand, Papua New Guinea, and the Philippines remained steady in 2004. Laos expanded its mined gold operation at Sepon, Province of Savannakhet, to 2.5 Mt/yr from 1.25 Mt/yr in 2004.

The Asia and the Pacific region was the world's major market for gold. India was the world's leading consumer of gold. The continuous strong economic growth and rising urban incomes led to higher demand for gold jewelery in China in the next decade. Gold demand in other countries in the region was expected to remain steady in the future.

Regional production of mined gold was expected to continue to increase at an average annual rate of 5% between 2004 and 2011. This prediction was based on gradual capacity expansions mainly at the major copper and gold mines in Australia, China, Indonesia, and Mongolia. Production of mined gold in Japan, Laos, New Zealand, Papua New Guinea, the Philippines, and Thailand was predicted to hold steady from 2004 to 2007 and to increase slightly with gradual capacity expansions of gold and copper mines between 2007 and 2011 (table 10).

Iron and Steel.—The region's production of iron ore was estimated to account for, in terms of metal content, about 40% of the world total in 2004. Australia ranked second in the world as a producer of iron ore; it was followed by China and India. The region's production of pig iron and direct-reduced iron (DRI) was estimated to account for about 57% of the world total. China, which ranked as the world's leading producer of pig iron, accounted for 35% of the world total; it was followed by Japan, which accounted for 11%. The region's production of crude steel was estimated to account for about 49% of the world total. China, which was by far the world's leading producer of crude steel, accounted for about 26% of the world total. Its crude steel output was slightly less than the combined total production of Japan, the United States, and Russia, which ranked second, third, and fourth, respectively (table 4).

East Asian countries were the world's leading consumers and importers of iron ore and accounted for about two-thirds of the world's total iron ore seaborne. Australia was Asia and the Pacific region's and the world's leading supplier of iron ore. During the past 2 years. India's iron ore output increased sharply to meet domestic and the regional demand. India replaced Brazil as China's second ranked iron ore supplier after Australia, and the trend was expected to continue for the next several years. Brazil and South Africa would continue to be major iron ore suppliers to the region. Imports of iron ore by East Asian countries were expected to continue to increase, especially by China to meet its domestic demand. Australia and India are the region's major iron ore suppliers

Regional production of iron ore was expected to increase at an average annual rate of about 4% between 2004 and 2011. This prediction was based on gradual capacity expansions in Australia, China, and India. Gradual capacity expansions in Australia are planned at the Rio Tinto's Marandoo, Nummuldi, Tom Price, and Yandicoogina mines and the Yandi operations of BHP Billiton Iron Ore Pty. Ltd.; the Mesa J and the West Angeles (Pannawonica) operations of Robe River Iron Associates; and the Jimblebar operation of BHP Iron Ore (Jimblebar) Pty. Ltd. In China, gradual expansion is planned for the following mines: Gaocun and Longqiao in Anhui Province; Heigou in Gansu Province; Mengjiagou, Nanmighe, and Sijiayin in Hebei Province; Hujiamiaozi in Liaoning Province; Shuijigou in the Nei Mongol Autonomous Region; Liguanji in Shandong Province; and Baima and Hongge in Sichuan Province. In India, a large new iron ore mine at Gandhamardan Malanjtoli, State of Orissa, was scheduled to start production in 2006 (table 11).

China was the world's leading consumer of iron and steel products. The country's steel products imports had decreased to 35 Mt in 2004 from 45 Mt in 2003. Japan was the world's leading exporter and the region's major supplier of iron and steel products to China and such major consumers in the region as the Republic of Korea, Singapore, Thailand, and Taiwan. Owing to the low steel consumption, the Association of Southeast Asian Nations steel sector remained a group of small steel producing countries in the region.

Regional production of pig iron and direct-reduced iron was expected to increase at an average annual rate of 5% between 2004 and 2011. This prediction was based on the reported capacity expansions mainly from Anshan Iron and Steel Group, Baogang Iron and Steel Group, Shagang Group, Shoudu Iron and Steel Group Co., and Wuhan Iron and Steel Group in China and at Nagamar, State of Chhattisgarh and Jamshedpur, State of Bihar, in India. Pig iron production in Japan, the Republic of Korea, and Taiwan was expected to hold steady between 2004 and 2011 (table 12).

Regional production of crude steel was expected to increase at an average annual rate of about 6% between 2004 and 2011. China was expected to lead in crude steel expansion in the region. Anshan Iron and Steel Group, Baogang Iron and Steel Group, Shagang Group, Shoudu Iron and Steel Group Co., Tangshan Iron and Steel Group, and Wuhan Iron and Steel Group, all of China, planned to expand their steel outputs by about 50% from their current capacities. India is also expected to expand its crude steel capacity significantly. The Indian Government planned to increase crude steel production to about 100 Mt in 2019 from 32 Mt in 2004, which included a 10-Mt/yr greenfield iron and steel plant proposed by BHP Billiton and Pohang Iron and Steel Co. Ltd. of the Republic of Korea in Orissa, expansion projects by Steel Authority of India Ltd. in Bhilai and at the Jamshedpur site, and a 6-Mt/yr greenfield iron and steel plant in Orissa by Tata Steel (table 13).

Lead and Zinc.—The region's production of mined lead and zinc accounted for about 55% and 41%, respectively, of the world total in 2004 (table 4). Australia's lead reserves ranked as the world's largest; those of China ranked second.

China ranked as the world's leading producer of mined lead and zinc and accounted for about 31% and 23%, respectively, of the world total in 2004; it was followed by Australia, which accounted for more than 21% and 14%, respectively. India and North Korea were the region's other important producers of mined lead and zinc; their production levels held steady in 2004. China was the world's leading producer of lead and zinc metal and Australia, India, Japan, and the Republic of Korea were the region's other important producers of lead and zinc (table 4).

China was the world's second ranked consumer of primary and secondary lead after the United States in 2004. China consumed more than 1 Mt. The substantial growth in demand for lead during the past several years was owing to the continuing increase in demand for storage batteries by the growing number of automobile producers in China. China also consumed more than 2 Mt of zinc metal. Japan and the Republic of Korea were the region's other important consumers of primary and secondary lead and primary slab zinc; their demands for lead and zinc have remained relatively steady during the past several years.

Regional production of mined lead and zinc was expected to increase at an average annual rate of about 3% and 5%, respectively, between 2004 and 2011. This prediction was based on reported capacity expansions in Australia, China, and India (tables 14, 20). Regional production of zinc metal and primary and secondary refined lead was expected to increase at an average annual rate of about 3%, 4%, and 3 %, respectively, between 2004 and 2011. This prediction was based on gradual capacity expansions mainly in Australia and China (tables 15, 16, 21).

Gradual capacity expansions were expected to be carried out at the Cannington Mine in Queensland by BHP Minerals Ltd. and at the George Fisher and the Hilton Mines at Mount Isa, Queensland, by MIM Holdings Ltd. in Australia. Vedanta Resources planned to expand its lead production at Chanderiya, India.

In China, reported capacity expansions were for a new lead-zinc mine in the Nei Mongol Autonomous Region by Dongshenmiao Lead and Zinc Mining Co.; a new lead-zinc mine at Lanping, Province of Yunnan, by Yunnan Jinding Zinc Co. Ltd.; the lead smelter and refinery at Jiyuan, Province of Henan, by Yuguang Gold and Lead Co. Ltd.; the zinc smelter in the Province of Hunan by Jinshi Mining Co. Ltd.; the zinc smelter and refinery at Chifeng, Nei Mongol Autonomous Region, by a joint venture of Biyinnuoer Lead and Zinc Co., Chifeng Hongye Zinc Smelter Co. Ltd., and Kumba Resources Ltd. of South Africa; the lead and zinc smelters and refineries at Baiyin, Province of Gansu, by Baiyin Nonferrous Metals Co. Ltd.; and the lead smelter at Hengyang, Province of Hunan, by Shuikoushan Nonferrous Metals Co. Ltd.

Nickel.—The region's production of mined nickel, in terms of metal content, accounted for about 38% of the world total in 2004. Australia ranked first in nickel reserves and was the world's second ranked producer of mined nickel after Russia in 2004. Indonesia and New Caledonia, which were the region's other major producers of mined nickel, accounted for 9% and 8%, respectively, of the world total (table 4).

Japan was the world's leading consumer and importer of nickel ore and nickel matte; more than 4 Mt/yr of nickel ore (gross weight) was imported from Indonesia, New Caledonia, and the Philippines for the production of ferronickel. Japan imported more than 100,000 t/yr of nickel matte from Australia and Indonesia for the production of refined nickel metal and chemicals. The country was the world's second ranked producer after Russia of primary nickel, which included chemicals, ferronickel, nickel oxide sinter, and pure nickel metal. China also was a key regional consumer and importer of nickel ore, matte, and pure metal.

Regional production of mined nickel was expected to continue to increase at an average annual rate of more than 7% between 2004 and 2011. This prediction was based on reported gradual expansions of capacity and increases in productivity (table 17). In Australia, BHP Billiton's Ravensthorpe mine was scheduled to begin operation in mid-2007 and to produce up to 50,000 t/yr of nickel. The concentrate would be shipped to the Yabulu refinery in Townsville for refining. In China, gradual capacity expansion was to be undertaken at Jinchuan, Province of Gansu, by Jinchuan Nonferrous Metals Corp. Baoshan Iron and Steel Group Co. and Yunnan Kunneng Co. Ltd. reached an agreement to develop a nickel mine in Yuanjiang County, Province of Yunnan, and to build a 10,000-t/yr nickel refinery by 2008. Construction of a 14,600-t/yr ferronickel plant by PT Aneka Tambang was underway in Indonesia. Sumitomo Metal Mining Co. Ltd. of Japan was constructing a greenfield hydrometallurgical plant to extract nickel from low-grade ores stockpiled at the Rio Tuba Mine on Palawan Island in the Philippines. Inco Limited of Canada began construction of a new large-scale mining and hydrometallurgical nickel-cobalt extraction complex at Goro in New Caledonia; the Goro complex was scheduled to be operational in September 2007. Falconbridge Ltd. was evaluating the Koniambo deposit near Kone in the Northern Province of New Caledonia.

Stainless steel production accounts for about 65% of total world nickel consumption, and the demand for nickel is linked to the development of stainless steel. In the past several years, the demand for stainless steel increased significantly, especially in China. During the past decade, China was a major stainless steel importing country and Japan, the Republic of Korea, and Taiwan supplied about 90% of China's total imports. During the past few years, China's stainless steel imports had declined as the output from Baogang and Taiyuan Iron and Steel Co. increased. China's stainless steel production is expected to grow strongly as several new mills begin operations in the next several years. Nickel consumption in China is expected to increase in the next several years and the nickel consumption in such other countries as Japan, the Republic of Korea, and Taiwan is predicted to decline in the future and will likely offset the increase in China.

Platinum-Group Metals.—The region's production of mined palladium and platinum was insignificant and accounted for only 0.7% and 0.3%, respectively, of the world total in 2004 (table 18 and 19). Jinchuan Nonferrous Metals of China produced palladium and platinum as byproducts of mined nickel from its nickel mining and refining operations at Jinchuan, Province of Gansu. Australia was not a primary producer of PGM, although small amounts of palladium were produced from Western Australia's Eastern Goldfield at Kalgoorlie-Boulder and Kambalda as a byproduct of nickel operations.

Regional production of mined platinum was expected to increase at an average annual rate of 4% between 2004 and 2011. This prediction was based on gradual capacity expansion of mined nickel in China (table 18). Regional production of mined palladium was expected to increase at an average annual rate of 2% between 2004 and 2011. This prediction was based on gradual capacity expansion of mined nickel in Australia and China (table 19). Regional PGM consumption was expected to increase in autocatalysts and electronics. The rapid growth in automobiles, light vehicles, computers, and electronic goods in China and India raised the demand for PGM in the region.

Industrial Minerals

Diamond.—The region's production of diamond accounted for more than one-quarter of the world total in 2004. In Australia, diamond was produced mainly from Western Australia. The Argyle Mine, which is located in the Ellendale diamond province of the western Kimberley region in Western Australia, was Australia's largest and the world's leading productive diamond mine. Diamond produced from the Argyle Mine by Rio Tinto accounted for about 20% of the world total in 2004. Another diamond mine operated by Rio Tinto was at the Merlin Mine in the Northern Trough in the Northern Territory of Australia.

Regional production of diamond was expected to stay in a narrow range of between 28 million and 31 million carats per year after reaching a peak level of 43 million carats in 2004 (table 22).

Phosphate Rock.—The region's production of phosphate rock, in terms of phosphorus pentoxide (P_2O_5) content, accounted for about 20% of the world total in 2004. China was the world's third ranked producer of phosphate rock after the United States and Morocco. Other important producers were Australia and India. Most of the region's production of phosphate rock was consumed within the region.

China was the world's leading consumer of phosphate rock. The country's demand for phosphate rock was expected to increase substantially in the next 5 years.

Regional phosphate rock production was expected to increase at an average annual rate of about 1%, which would lead to a shortage in the regional supply because the regional growth in demand for phosphate rock was predicted to grow at a much higher rate than 1% per year during the next 5 to 6 years (table 23).

Mineral Fuels

Coal.—The region's overall production of coal, which included anthracite, bituminous, and lignite, accounted for more than 50% of the world total in 2004. Production of anthracite coal, however, accounted for about 86% of the world total; production of bituminous coal accounted for about 57%; and production of lignite accounted for about 19%. China, which was by far the world's leading producer of anthracite and bituminous coals, accounted for about 70% and 40%, respectively, of the world total. In the Asia and the Pacific region, North Korea and Vietnam were the other significant producers of anthracite coal; Australia, India, and Indonesia were the other important producers of bituminous coal and lignite (table 4).

Japan was the world's leading importer and consumer of coal; virtually all coal requirements for its iron and steel and utility industries was imported. In 2004, the country imported more than 180 Mt of coal, of which 118 Mt was bituminous (steam); 56 Mt, metallurgical-grade bituminous (coking); and 6 Mt, anthracite. Australia ranked as the world's leading coal exporter. The major regional coal exporters (suppliers) were Australia, China, and Indonesia. Mongolia and Vietnam were minor players in the regional exported market.

Regional overall coal production was expected to increase at an average annual rate of about 10% between 2004 and 2011. This prediction was based on capacity expansions at the Hail Creek coking coal deposit in the northern Bowen Basin of central Queensland, Australia, by Rio Tinto; at the Shoushan coal mine in the Province of Henan, China, by Pingabo Coal Co.; at major coal mines in the Province of Shaanxi and the Nei Mongol and the Ningxia Autonomous Regions, China, by Shenhua Coal Corp.; at the Tavan Tolgoi coal project in Mongolia; and at six major coal mines in the Province of Quang Ninh in Vietnam, by Vietnam National Coal Corporation (table 24).

Natural Gas and Petroleum.—The Asia and the Pacific region lacks sufficient resources of natural gas and petroleum to meet the rapid regional growth in demand for hydrocarbons. The region's production of natural gas and crude petroleum accounted for about 11% and 10%, respectively, of the world total production in 2004 (table 4). Indonesia was the region's leading producer of natural gas; it was followed by Malaysia, China, and Australia. China was the leading producer of crude petroleum and was followed by Indonesia, Malaysia, and India. Australia, Brunei, Indonesia, and Malaysia were the region's major exporters of natural gas in the form of liquefied natural gas. Brunei, Indonesia, Malaysia, and Vietnam were the major exporters of crude petroleum.

Japan was the world's leading importer and consumer of natural gas and crude petroleum; about 75.2 billion cubic meters of natural gas and 1.5 billion barrels of crude petroleum were imported in 2004. Other important consumers of natural gas and crude petroleum in the region were China, India, the Republic of Korea, Thailand, and Taiwan. Australia, Brunei, Indonesia, and Malaysia were the region's major suppliers of natural gas and crude petroleum to Japan, the Republic of Korea, Singapore, and Taiwan.

Regional production of natural gas was expected to increase at an average annual rate of about 2% between 2004 and 2011. This prediction was based on gradual capacity expansions at Arun, Aceh Special Region, by ExxonMobil Oil Indonesia and offshore East Kalimantan by Total Indonesia and HUFFCO Group in Indonesia; offshore Sarawak, Malaysia, by Sarawak Shell Bhd.; and in the Province of Sichuan, by China National Petroleum Corp. (table 25). China will likely become one of the world's leading importers and consumers of natural gas during the next 5 to 10 years. The Chinese Government projected that demand for natural gas would be 63 billion cubic meters in 2005 and could reach 97 billion cubic meters by 2010.

Regional production of crude petroleum was expected to increase at an average annual rate of less than 2% between 2004 and 2011. This prediction was based on gradual capacity expansions at Mina, Duri, and other major oilfields in central Sumatra by PT Caltex Pacific Indonesia and several major oilfields offshore East Kalimantan in Indonesia; at Liaohe, Province of Liaoning, by Liaohe Bureau; in Bohai by Bohai Offshore Oil Corp.; and offshore Nanhai (South Sea) by Nanhai East Corp. in China (table 26). Because of rapid growth in demand for crude petroleum, China's crude petroleum imports increased by 15% to 69 Mt in 2002 and by 32% to 91 Mt in 2003 and by 34% to 122 Mt in 2004. China overtook Japan as the region's leading importer of crude petroleum in 2004.

Uranium.—The region's uranium resources were mainly in Australia, which ranked first in known recoverable resources of uranium in the world and accounted for 28% of the world total. The country, which ranked second after Canada in the production of mined uranium, accounted for 22% of the world total in 2004. In Australia, three active mines were operated, and two more were under development. China was thought to produce about 1,300 t/yr of mined uranium in 2004, and production was expected to increase gradually to 1,500 t/yr by 2011. Most mined uranium was enriched and consumed domestically in China. China planned to add 10 more nuclear powerplants in the coastal area during the next 10 years to relieve the electricity shortage in the area. China's uranium consumption was expected to increase and the country was interested in investing in uranium mines in Australia.

Australia exported nearly all its mined uranium in the form of uranium oxide (U_3O_8) to China, Japan, and the Republic of Korea within the region and to France, Spain, Sweden, the United Kingdom, and the United States.

Regional production of mined uranium was expected to increase at an average annual rate of about 2% between 2004 and 2011. This prediction was based mainly on capacity expansions at the Olympic Dam Mine by WMC Resources Ltd. and two in situ leach operations at Beverly by Heathgate Resources Pty. Ltd. and at Honeymoon by Southern Cross Resources Inc. in South Australia (table 27).

Environment

The Japanese Government amended the Enforcement Order of Industrial Safety and Health Law to prohibit the use of 10 products containing asbestos with more than 1% gravity. The Indonesian Government investigated complaints by the locals that the PT Newmont Minahasa Raya operation in Minahasa polluted Buyat Bay. Water and fish were allegedly contaminated by Newmont's tailing that were disposed of in Buyat Bay. A problem with cadmium contamination was discovered at Padaeng Industry Public Co. Ltd.'s mine site in the vicinity of Mao Tao Creek in Thailand. A study was undertaken to find sustainable and systematic ways to solve the problem.

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TABLE 1
ASIA AND THE PACIFIC: AREA AND POPULATION IN 2004

Country	Area[1] total (square kilometers)	Population[2] total (thousands)
Afghanistan	647,500	29,929 [1]
Australia	7,687,850	20,120
Bangladesh	144,000	140,494
Bhutan	47,000	896
Brunei	5,770	361
Burma	678,500	49,910
Cambodia	181,040	13,630
China	9,596,960	1,296,500
Fiji	18,270	848
Hong Kong	1,092	6,845
India	3,287,590	1,079,721
Indonesia	1,919,440	217,588
Japan	377,835	127,764
Korea, North	120,540	22,745
Korea, Republic of	98,480	48,142
Laos	236,800	5,792
Malaysia	329,750	25,209
Mongolia	1,565,000	2,515
Nepal	140,800	25,190
New Caledonia	19,060	229
New Zealand	268,680	4,061
Pakistan	803,940	152,061
Papua New Guinea	462,840	5,625
The Philippines	300,000	82,987
Singapore	692	4,335
Solomon Islands	28,450	471
Sri Lanka	65,610	19,444
Taiwan	35,980	22,894 [1]
Thailand	514,000	62,387
Timor, East	15,007	925
Vietnam	329,560	82,162
Total	29,928,036	3,551,780
World Total	148,940,000	6,345,127

[1] Source: Central Intelligence Agency World Factbook 2005.

[2] Source: World Bank 2005, World Development Indicators Database, September.

TABLE 2
ASIA AND THE PACIFIC: ECONOMY IN 2004[1, 2]

Country	Gross domestic product based on purchasing power parity Total (million dollars)	 Per capita (dollars)	Real gross domestic product growth rate (percentage)
Afghanistan	NA	NA	7.5
Australia	602,142	29,893	3.2
Bangladesh	279,793	1,875	5.8
Bhutan	2,638	3,095	7.9
Brunei	8,589	24,143	1.7
Burma	74,104	1,364	5.0
Cambodia	29,245	2,074	7.7
China	7,334,254	5,642	9.5
Fiji	5,078	5,997	4.1
Hong Kong	212,467	30,558	8.1
India	3,290,800	3,080	7.3
Indonesia	801,432	3,702	5.1
Japan	3,817,221	29,906	2.7
Korea, North[3]	30,900	1,400	2.2
Korea, Republic of	1,029,848	21,419	4.6
Laos	11,145	1,921	6.4
Malaysia	265,455	10,423	7.1
Mongolia	4,831	1,918	10.6
Nepal	37,087	1,402	3.4
New Caledonia	NA	NA	NA
New Zealand	97,074	23,944	4.8
Pakistan	360,813	2,388	7.1
Papua New Guinea	13,581	2,357	2.7
The Philippines	383,038	4,561	6.0
Singapore	115,711	26,799	8.4
Solomon Islands	863	1,845	5.5
Sri Lanka	79,020	3,882	5.4
Taiwan	589,534	25,983	5.7
Thailand	512,344	7,901	6.1
Timor, East	NA	NA	1.8
Vietnam	210,937	2,570	7.7
Total	20,199,944	XX	XX
World total	55,654,621	XX	XX

NA Not available. XX Not applicable.

[1] Includes data available as of January 1, 2005. Gross domestic product listed may differ from that reported in individual country chapters owing to differences in source or date of reporting.

[2] Source: International Monetary Fund, World Economic Outlook Database, September 2005.

[3] Source: Central Intelligence Agency World Factbook 2005.

TABLE 3
ASIA AND THE PACIFIC: SELECTED EXPLORATION SITES IN 2004[1]

Country	Type[2]	Site	Commodity	Company	Resources[3]	Activity[4]
Australia	F	Indee	Au	Range River Gold Ltd.	165,000 oz Au	Feasibility drilling.
Do.	E	Lord Nelson/Lord Henry	Au	Troy Resources NL	319,000 oz Au	Extensive drilling.
Do.	E	Paulsens	Au	Nustar Mining Corp. Ltd.	481,000 oz Au	Do.
Do.	E	Prominent Hill	Cu, Au	Oxiana Ltd.	1.4 Mt Cu, 1.5 Moz Au	Do.
China	E	Boka	Au	Southwestern Resources Corp.	Data not released.	Do.
Do.	F	Jinfeng	Au	Sino Gold Ltd.	2.1 Moz Au	Feasibility drilling.
Do.	E	Maoling	Au	Mundoro Mining Inc.	3 Moz Au	Extensive drilling.
Do.	P	Tanjianshan	Au	Afcan Mining Corp.	1 Moz Au	Do.
Indonesia	P	Grasberg/Deep MLZ	Cu, Au	Freeport-McMoRan Copper & Gold Inc.	1.8 Mt Cu, 4.4 Moz Au	Do.
Malaysia	P	Penjom	Au	Avocet Mining plc	473,000 oz Au	Do.
Mongolia	E	Turquoise Hill/Hugo North	Cu, Au	Ivanhoe Mines Ltd.	4.98 Mt Cu, 12.3 Moz Au	Do.
New Zealand	P	Macraes/Frasers	Au	Oceana Gold Ltd.	Data not released.	Do.
Pakistan	F	Reko Diq/H4	Cu, Au	Tethyan Copper Company Ltd.	884,100 t Cu	Feasibility drilling.
Vietnam	F	Ban Phuc	Ni, Cu, Co	Asian Mineral Resources Ltd.	64,600 t Ni, 10,200 t Cu	Do.

[1] Abbreviations used for commodities in this table include the following: Au--gold; Co--Cobalt; Cu--copper; Ni--nickel.

Abbreviations used for units of measure include the following: Moz-million troy ounces; Mt-million metric tons; oz-troy ounces; t-metric tons.

[2] E-Active exploration; F-Feasibility work ongoing/completed; P-Exploration at producing site.

[3] Resources reported where available based on data from various sources and reflect unverified public information reported by trade journals.

[4] Sites where extensive (greater than 10,000 meters) drilling or significant (more than $5 million) expenditure have been reported.

TABLE 4
ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2004[1]

(Thousand metric tons unless otherwise specified)

	Metals										
	Aluminum			Copper			Iron and steel			Lead	
							Iron				
Country	Alumina	Bauxite	Metal[2]	Mine output, Cu content	Refined, primary	Gold, mine output, Au content (kilograms)	Ore, gross weight	Pig	Steel, crude	Mine output, Pb content	Refined, primary
Afghanistan	--	--	--	5 [e]	--	--	--	--	--	--	--
Australia	16,525	43,993	2,027	656	383	259,000	230,955	9,700 [e]	8,411	678	266
Bangladesh	--	--	--	--	--	--	--	--	25 [e]	--	--
Bhutan	--	--	--	--	--	--	--	--	--	--	--
Brunei[3]	--	--	--	--	--	--	--	--	--	--	--
Burma	--	--	--	32	32	100 [e]	--	2 [e]	25 [e]	1 [e]	(4)
Cambodia	--	--	--	--	--	--	--	--	--	--	--
China[e]	6,990	15,000	6,900	610	1,630	215,000	310,000	251,850 [5]	272,800 [5]	950	1,500
Christmas Island	--	--	--	--	--	--	--	--	--	--	--
Fiji	--	--	--	--	--	3,800 [e]	--	--	--	--	--
Hong Kong[3]	--	--	--	--	--	--	--	--	--	--	--
India[e]	2,600	11,275 [5]	862 [5]	29 [5]	377	-- [5]	126,000 [5]	25,000	32,000	40 [5]	42 [5]
Indonesia	--	1,331	230 [e]	840	211	92,936	--	1,470	2,800 [e]	--	--
Japan	340 [e]	--	1,076	--	1,188	8,021	--	82,974	112,718	6	94
Korea, North[e]	--	--	--	12	15	6,000	4,580	900	1,070	20	7
Korea, Republic of	--	--	--	--	496	233	496	27,556	47,521	(4)	174
Laos	--	--	--	--	--	4,400 [e]	--	--	--	--	--
Malaysia	--	2	--	--	--	4,221	664	--	4,200 [e]	--	--
Mongolia	--	--	--	130	2	18,600	--	--	40 [e]	--	--
Nauru	--	--	--	--	--	--	--	--	--	--	--
Nepal	--	--	--	--	--	--	--	--	--	--	--
New Caledonia	--	--	--	--	--	--	--	--	--	--	--
New Zealand	--	--	372	--	--	10,151	--	650 [e]	850 [e]	--	--
Pakistan	--	5	--	--	--	--	86	1,700 [e]	600 [e]	--	--
Papua New Guinea	--	--	--	177	--	67,000 [e]	--	--	--	--	--
Philippines	--	--	--	16	175	35,464	--	--	550 [e]	--	--
Singapore	--	--	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--	--	--
Sri Lanka	--	--	--	--	--	--	--	--	--	--	--
Taiwan	--	--	--	--	--	--	--	10,198	19,604	--	--
Thailand	--	--	--	--	18	4,500	136	--	4,533	--	2
Vietnam[e]	--	--	--	--	--	2,000	650	--	658 [5]	1	--
Total	26,500	71,600	11,500	2,510	4,530	731,000	674,000	412,000	508,000	1,700	2,090
Share of 2004 world total	44.4%	48.7%	32.6%	17.5%	31.4%	30.0%	49.8%	57.5%	48.7%	54.9%	61.7%
Share of 2003 world total	44.6%	52.3%	31.7%	20.9%	32.2%	30.6%	46.5%	55.5%	46.5%	53.2%	60.0%
United States	5,350	NA	2,520	1,160	1,260	258,000	54,700	42,300	99,700	445	148
World total	59,600	147,000	35,100	14,300	14,400	2,430,000	1,350,000	717,000	1,040,000	3,090	3,380

See footnotes at end of table.

TABLE 4--Continued
ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2004[1]

(Thousand metric tons unless otherwise specified)

	Metals								
	Manganese ore, mine output, Mn content	Mercury, mine output, Hg content (metric tons)	Nickel		Tin, metric tons		Tungsten, mine output, W content (metric tons)	Zinc, metric tons	
Country			Mine output, Ni content	Refined	Mine output, Sn content	Metal, primary		Mine output, Zn content	Metal[2]
Afghanistan	--	--	--	--	--	--	--	--	--
Australia	1,327	--	178	185	1,306	467	--	1,334,000	477,500
Bangladesh	--	--	--	--	--	--	--	--	--
Bhutan	--	--	--	--	--	--	--	--	--
Brunei[3]	--	--	--	--	--	--	--	--	--
Burma	(4)	--	(4)	--	526	30 [e]	107	196	--
Cambodia	--	--	--	--	--	--	--	--	--
China[e]	900	425	64	72	110,000	115,000	67,000	2,100,000	2,500,000
Christmas Island	--	--	--	--	--	--	--	--	--
Fiji	--	--	--	--	--	--	--	--	--
Hong Kong[3]	--	--	--	--	--	--	--	--	--
India[e]	630	--	--	--	--	--	--	184,000	262,400 [5]
Indonesia	--	--	133	--	65,772	49,872	--	--	--
Japan	--	--	--	33	--	707	--	47,781	667,247
Korea, North[e]	--	--	--	--	--	--	600	62,000	67,000
Korea, Republic of	--	--	--	27	--	--	--	14	668,666
Laos	--	--	--	--	340 [e]	--	--	300 [e]	--
Malaysia	--	--	--	--	2,745	33,914	--	--	--
Mongolia	--	--	--	--	--	--	40 [e]	--	--
Nauru	--	--	--	--	--	--	--	--	--
Nepal	--	--	--	--	--	--	--	--	--
New Caledonia	--	--	118 [p]	--	--	--	--	--	--
New Zealand	--	--	--	--	--	--	--	--	--
Pakistan	--	--	--	--	--	--	--	--	--
Papua New Guinea	--	--	--	--	--	--	--	--	--
Philippines	--	--	17	--	--	--	--	--	--
Singapore	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--
Sri Lanka	--	--	--	--	--	--	--	--	--
Taiwan	--	--	--	11 [e]	--	--	--	--	--
Thailand	2	--	--	--	586	20,800	180 [e]	43,400 [e]	68,300
Vietnam[e]	--	--	--	--	3,500	3,500	--	40,000	--
Total	2,860	425	510	328	185,000	224,000	67,900	3,810,000	4,710,000
Share of 2004 world total	29.4%	26.0%	35.5%	34.3%	63.3%	73.8%	91.4%	41.7%	46.4%
Share of 2003 world total	31.2%	26.0%	36.7%	37.1%	71.2%	72.9%	84.1%	40.9%	46.8%
United States	--	NA	--	--	--	--	--	739,000	305,000
World total	9,720	1,630	1,440	957	292,000	304,000	74,300	9,140,000	10,200,000

See footnotes at end of table.

TABLE 4--Continued
ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2004[1]

(Thousand metric tons unless otherwise specified)

	Industrial minerals						Mineral fuels			
							Coal			
Country	Cement, hydraulic	Fluorspar (metric tons)	Graphite (metric tons)	Magnesite	Mica (metric tons)	Salt	Anthracite	Bituminous	Natural gas, dry (million cubic meters)	Petroleum, crude (thousand 42-gallon barrels)
Afghanistan	120 [e]	--	--	--	--	13 [e]	--	185 [e]	2,500 [e]	--
Australia	8,000 [e]	--	--	474	--	11,221	--	257,790	30,000 [e]	250,000 [e]
Bangladesh	5,000 [e]	--	--	--	--	350	--	--	7,100 [e]	1,700 [e]
Bhutan	170 [e]	--	--	--	--	--	--	67 [e]	--	--
Brunei[3]	242	--	--	--	--	--	--	--	11,500 [e]	70,000 [e]
Burma	519	--	--	--	--	35 [e]	--	--	10,277	7,160
Cambodia	--	--	--	--	--	40 [e]	--	--	--	--
China[e]	970,000 [5]	2,700,000	700,000	4,650	--	37,100 [5]	220,000	1,690,000	34,000	1,300,000
Christmas Island	--	--	--	--	--	--	--	--	--	--
Fiji	100 [e]	--	--	--	--	--	--	--	--	--
Hong Kong[3]	1,039	--	--	--	--	--	--	--	--	--
India[e]	125,000	10,700	120,000	370	3,700	15,003 [5]	--	330,000	26,000	244,000
Indonesia	36,000 [e]	--	--	--	--	680 [e]	50 [e]	132,000 [e]	52,000 [e]	362,000
Japan	67,376	--	--	--	--	1,225	--	1,339	3,021	5,250
Korea, North[e]	5,630	12,000	25,000	1,200	--	500	16,300	--	--	--
Korea, Republic of	54,330	--	247	--	59,238	800 [e]	3,248	--	--	--
Laos	250 [e]	--	--	--	--	15 [e]	--	220 [e]	--	--
Malaysia	22,833	--	--	--	3,544	--	--	389	53,688	279,000
Mongolia	170 [e]	295,000	--	--	--	2 [e]	--	197	--	190
Nauru	--	--	--	--	--	--	--	--	--	--
Nepal	300 [e]	--	--	--	--	4	--	10	--	--
New Caledonia	100 [p]	--	--	--	--	--	--	--	--	--
New Zealand	1,000 [e]	--	--	--	--	70 [e]	720	4,152	5,000 [e]	8,710
Pakistan	10,400 [e]	1,026	--	5	--	1,606	--	3,275	29,773	22,600
Papua New Guinea	--	--	--	--	--	--	--	--	1,450	20,000
Philippines	8,500 [e]	--	--	--	--	430 [e]	--	1,996	--	2,000 [e]
Singapore	--	--	--	--	--	--	--	--	--	--
Solomon Islands	--	--	--	--	--	--	--	--	--	--
Sri Lanka	1,400 [e]	--	3,400 [e]	--	1,700 [e]	79 [e]	--	--	--	--
Taiwan	19,050	--	--	--	2,973	--	--	--	720 [e]	280
Thailand	35,626	2,375	--	--	--	1,131	--	--	22,366	56,200
Vietnam[e]	25,320 [5]	3,000	--	--	--	1,300	26,820 [5]	--	6,250 [5]	143,000 [5]
Total	1,400,000	3,020,000	849,000	6,700	71,200	71,600	267,000	2,420,000	296,000	2,770,000
Share of 2004 world total	64.9%	57.1%	86.3%	47.6%	21.8%	31.3%	85.5%	57.1%	10.8%	10.2%
Share of 2003 world total	63.9%	58.7%	87.2%	49.3%	16.5%	31.0%	86.1%	54.9%	10.4%	10.4%
United States	99,000	--	--	W	99,200	46,500	1,550	932,000	531,000	1,980,000
World total	2,150,000	5,300,000	983,000	14,100	326,000	228,000	312,000	4,240,000	2,750,000	27,200,000

See footnotes at end of table.

TABLE 4--Continued

ASIA AND THE PACIFIC: PRODUCTION OF SELECTED COMMODITIES IN 2004[1]

[e] Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. [p] Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in world total. -- Zero or zero percent.

[1] Totals may not add due to independent rounding. Percentages are calculated on unrounded data. Table includes data available as of March 31, 2006.

[2] Primary and secondary production.

[3] Not in Minerals Yearbook, volume III.

[4] Less than 1/2 unit.

[5] Reported figure.

TABLE 5
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 1990-2011[1]

(Thousand metric tons, gross weight)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	41,400	42,700	53,800	43,993	57,000	60,000	63,000
China	2,400	5,000	9,000	15,000	20,000	22,000	25,000
India	4,850	5,240	7,560	11,275	14,000	16,000	18,000
Indonesia	1,210	899	1,150	1,331	1,700	1,900	2,100
Malaysia	398	184	123	2	--	--	--
Other	3	3	9	5	25	25	1,700
Total	50,300	54,000	72,000	72,000	93,000	100,000	110,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Totals are rounded.

TABLE 6
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PRIMARY ALUMINUM METAL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	1,230	1,300	1,770	1,900	2,200	2,500	3,500
China	847	1,750	2,800	6,700	9,400	10,000	10,000
India	433	537	644	862	890	910	930
Indonesia	186	220	160	230	240	250	250
New Zealand	260	273	328	372	350	350	450
Other	34	18	7	6	410	610	710
Total	2,990	4,100	5,700	10,100	13,500	15,000	16,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 7
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED SECONDARY ALUMINUM METAL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
China	7	12	175	200	350	400	600
Japan	1,100	1,200	1,210	1,015	1,000	1,000	1,000
Total	1,100	1,200	1,390	1,200	1,350	1,400	1,600

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 8

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 1990-2011[1]

(Metal content in thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	327	398	829	656	910	1,000	1,200
China	285	445	593	610	650	660	700
India	58	47	32	29	28	26	26
Indonesia	164	444	1,010	840	1,250	1,260	1,300
Mongolia	124	122	125	130	180	250	300
Papua New Guinea	170	213	203	177	210	200	200
Philippines	182	108	130	159	160	160	160
Other	25	26	44	49	160	280	380
Total	1,340	1,800	2,970	2,650	3,600	3,800	4,300

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 9

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED REFINED COPPER METAL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	274	248	488	383	650	700	800
China	560	1,080	1,370	2,150	3,000	3,300	3,600
India	42	40	243	377	400	440	480
Indonesia	--	--	158	211	240	240	300
Japan	1,010	1,190	1,440	1,380	1,400	1,600	1,600
Korea, Republic of	186	235	468	496	530	530	530
Other	161	187	195	244	400	450	550
Total	2,230	2,980	4,360	5,240	6,600	7,300	7,900

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Totals are rounded.

TABLE 10

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 1990-2011[1]

(Metal content in kilograms)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	244,000	254,000	269,000	259,000	270,000	300,000	350,000
China	100,000	140,000	180,000	215,000	230,000	250,000	260,000
Indonesia	11,200	64,000	125,000	92,936	195,000	200,000	210,000
Japan	7,300	9,190	8,400	8,021	8,200	8,200	8,200
Korea, North	5,000	5,000	6,600	6,000	6,000	6,000	6,000
Mongolia	1,000	4,500	11,800	18,600	26,000	30,000	33,000
New Zealand	4,630	12,100	9,880	10,151	11,000	12,000	13,000
Papua New Guinea	31,900	51,700	74,500	67,000	72,000	74,000	80,000
Philippines	24,600	27,000	36,500	35,464	36,000	38,000	48,000
Other	9,940	9,330	17,400	23,054	28,900	31,100	30,300
Total	439,000	577,000	739,000	735,000	880,000	950,000	1,000,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 11

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED BENEFICIATED IRON ORE PRODUCTION, 1990-2011[1]

(Metal content in thousand metric tons)

Country	Average ore grade (% Fe)	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	62	69,800	88,700	107,000	144,000	147,000	160,000	175,000
China	64	55,000	82,300	73,600	102,000	120,000	130,000	140,000
India	64	34,400	41,700	48,600	80,600	90,000	92,000	93,000
Korea, North	NA	4,700	2,000	1,100	1,300	1,500	1,500	5,000
Other		1,160	1,240	1,480	1,630	2,000	1,980	1,980
Total		165,000	216,000	232,000	330,000	360,000	390,000	420,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. NA Not available.

[1] Totals are rounded.

TABLE 12

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED DIRECT-REDUCED IRON AND PIG IRON PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	6,130	7,860	6,110	9,700	10,000	10,000	11,000
China	62,400	105,000	131,000	251,850	360,000	400,000	420,000
India	13,400	22,900	26,800	30,800	32,000	33,000	33,000
Japan	80,200	74,900	81,070	82,974	82,000	82,000	82,000
Korea, Republic of	15,300	22,300	24,900	27,556	28,000	30,000	30,000
Taiwan	5,470	6,060	9,970	10,198	11,000	11,500	12,000
Other	8,650	3,410	5,960	6,402	7,400	8,800	9,400
Total	192,000	242,000	286,000	419,000	530,000	580,000	600,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 13

ASIA AND THE PACIFIC: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	6,670	8,450	7,300	8,411	10,000	10,000	20,000
China	66,100	95,400	129,000	272,800	400,000	460,000	510,000
India	15,000	22,800	26,900	32,000	34,000	36,000	38,000
Japan	110,000	102,000	106,400	112,718	113,000	113,000	113,000
Korea, Republic of	23,100	36,800	43,100	47,521	49,000	51,000	51,000
Malaysia	1,200	2,450	2,430	4,200	4,500	5,000	5,200
Taiwan	9,750	11,600	17,300	19,604	19,500	20,000	20,000
Thailand	685	2,134	2,100	4,533	4,500	5,000	6,000
Other	13,400	14,900	6,030	6,618	7,300	8,050	9,500
Total	246,000	297,000	341,000	508,000	640,000	710,000	770,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 14
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED LEAD MINE PRODUCTION, 1990-2011[1]

(Metal content in metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	570,000	455,000	739,000	678,000	716,000	718,000	720,000
China	315,000	520,000	660,000	950,000	1,000,000	1,100,000	1,200,000
India	23,200	34,000	28,900	39,800	42,000	44,000	45,000
Japan	18,700	9,660	8,840	5,500	--	--	--
Korea, North	80,000	75,000	9,000	20,000	20,000	20,000	20,000
Vietnam	--	1,000	1,000	1,000	1,000	1,000	1,000
Other	24,900	12,080	16,800	500	2,500	2,500	2,500
Total	1,030,000	1,110,000	1,460,000	1,690,000	1,800,000	1,900,000	2,000,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Totals are rounded.

TABLE 15
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PRIMARY REFINED LEAD PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	212	215	223	266	240	250	266
China	260	458	998	1,500	1,800	2,000	2,200
India	29	62	57	42	50	55	60
Japan	205	148	130	94	95	95	95
Korea, North	70	65	7	7	7	7	7
Korea, Republic of	61	130	171	174	175	175	175
Other	2	10	4	2	2	2	2
Total	839	1,090	1,590	2,090	2,400	2,600	2,800

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 16
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED SECONDARY REFINED LEAD PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	17	26	28	34	40	40	40
China	36	150	102	350	400	450	500
India	17	28	21	25	28	30	30
Japan	122	140	182	189	195	200	200
Malaysia	16	34	35	40	42	42	42
Philippines	12	17	16	25	26	27	27
Thailand	16	11	24	28	28	28	28
Other	16	25	12	23	23	23	23
Total	252	431	420	714	780	840	890

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 17
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED NICKEL MINE PRODUCTION, 1990-2011[1]

(Metal content in metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	67,800	103,000	167,000	178,000	230,000	250,000	350,000
China	33,000	41,800	50,300	64,000	66,000	67,000	70,000
Indonesia	68,300	88,200	98,200	133,000	160,000	180,000	180,000
New Caledonia	85,100	120,000	126,000	118,300	125,000	150,000	160,000
Philippines	15,800	15,100	17,400	17,000	30,000	32,000	3,500
Total	270,000	368,000	459,000	510,000	610,000	680,000	760,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 18
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PLATINUM MINE PRODUCTION, 1990-2011[1]

(Metal content in kilograms)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	100	100	171	200	230	230	300
China	260	300	650	800	850	900	1,000
Total	360	400	820	1,000	1,100	1,100	1,300

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 19
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PALLADIUM MINE PRODUCTION, 1990-2011[1]

(Metal content in kilograms)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	400	400	812	800	950	1,000	1,000
China	130	170	350	450	500	550	650
Total	500	600	1,160	1,300	1,450	1,550	1,650

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 20
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED ZINC MINE PRODUCTION, 1990-2011[1]

(Metal content in thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	933	937	1,420	1,334	1,600	1,800	2,500
China	619	1,010	1,780	2,100	2,300	2,500	2,600
India	74	155	144	184	190	195	200
Japan	127	95	64	48	--	--	--
Korea, North	230	150	60	62	65	70	70
Thailand	11	23	27	43	40	40	40
Vietnam	10	14	13	40	40	50	50
Other	2	1	--	1	62	62	63
Total	2,010	2,390	3,510	3,810	4,300	4,700	5,500

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Totals are rounded.

TABLE 21
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED ZINC METAL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	303	320	490	478	600	700	800
China	550	1,080	1,980	2,500	2,600	2,800	3,000
India	79	171	201	262	280	290	300
Japan	732	711	699	667	700	700	700
Korea, North	200	150	65	67	67	70	100
Korea, Republic of	248	279	474	669	680	700	700
Thailand	63	56	101	115	120	120	120
Total	2,180	2,770	4,010	4,760	5,100	5,400	5,700

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 22
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED DIAMOND PRODUCTION, 1990-2011[1]

(Thousand carats)

Country (average % gem grade)	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	34,600	40,700	26,600	43,311	28,000	30,000	30,000
China	1,000	1,130	1,150	100	100	100	100
India	15	21	16	16	18	19	20
Indonesia	23	22	23	23	23	23	30
Total	35,600	41,900	27,800	43,500	28,000	30,000	30,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 23
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED PHOSPHATE ROCK PRODUCTION, 1990-2011[1]

(P_2O_5 content in thousand metric tons)

Country		1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	--	1	225	220	550	600	650
China	6,400	7,960	5,820	7,560	7,700	7,800	7,800
India	181	360	336	338	340	340	340
Philippines	3	8	109	110	115	120	125
Vietnam	96	178	236	240	240	250	250
Other	526	509	508	355	240	190	170
Total	7,210	9,020	7,010	8,600	8,600	8,700	9,300

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Totals are rounded.

TABLE 24
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 1990-2011[1]

(Thousand metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	199,000	194,000	313,000	225,000	352,000	355,000	456,000
China	1,010,000	1,310,000	957,000	1,960,000	2,250,000	2,400,000	2,600,000
India	226,000	290,000	335,000	355,000	370,000	380,000	390,000
Indonesia	10,000	40,000	77,200	137,000	160,000	170,000	180,000
Japan	7,980	6,260	3,130	1,339	--	--	--
Korea, North	68,000	70,000	22,500	22,800	26,000	26,000	26,000
Korea, Republic of	17,200	5,720	4,170	3,248	3,400	3,400	3,400
Mongolia	7,160	5,019	5,185	6,800	8,000	10,000	12,000
New Zealand	2,580	3,445	3,586	4,872	5,600	5,600	5,700
Pakistan	2,730	2,997	3,116	3,275	3,370	3,400	3,440
Philippines	1,190	1,200	1,300	1,996	1,700	1,700	1,800
Thailand	14,200	18,400	17,786	20,060	21,000	22,000	23,000
Vietnam	4,020	8,350	11,600	26,820	28,000	30,000	40,000
Other	320	517	837	1,110	1,120	1,130	1,120
Total	1,570,000	1,960,000	1,760,000	2,770,000	3,200,000	3,400,000	3,700,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. -- Negligible or no production.

[1] Totals are rounded.

TABLE 25
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED NATURAL GAS PRODUCTION, 1990-2011[1]

(Million cubic meters)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	20,700	29,700	30,800	30,000	32,000	40,000	40,000
Brunei	9,450	11,200	10,800	11,500	12,000	12,000	13,000
Burma	993	1,477	8,477	10,277	10,500	10,500	10,500
China	15,000	18,000	22,000	41,000	44,000	46,000	48,000
India	10,200	17,800	30,000	28,000	26,000	25,000	25,000
Indonesia	61,000	85,100	82,300	83,740	92,000	94,000	95,000
Malaysia	18,500	36,500	56,900	67,530	70,000	70,000	70,000
Pakistan	14,150	16,839	24,222	25,000	26,000	26,000	30,000
Thailand	7,210	11,400	20,200	22,366	23,000	25,000	26,000
Other	15,170	17,310	19,990	25,880	26,300	26,900	27,300
Total	172,000	245,000	306,000	345,000	360,000	375,000	390,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 26
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED CRUDE PETROLEUM PRODUCTION, 1990-2011[1]

(Million 42-gallon barrels)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	211	185	264	250	230	240	240
China	1,010	1,100	1,200	1,300	1,400	1,400	1,450
India	250	258	238	244	246	247	248
Indonesia	534	580	516	362	420	450	450
Malaysia	227	257	249	279	260	260	260
Vietnam	20	64	115	143	145	150	160
Other	104	154	160	170	171	171	175
Total	2,360	2,600	2,700	2,800	2,900	2,900	3,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

TABLE 27
ASIA AND THE PACIFIC: HISTORIC AND PROJECTED URANIUM MINE PRODUCTION, 1990-2011[1]

(Metal content in metric tons)

Country	1990	1995	2000	2004	2007[e]	2009[e]	2011[e]
Australia	3,530	3,700	7,580	8,910	9,000	9,100	9,200
China	100	500	1,000	1,300	1,500	1,500	1,500
Total	3,600	4,200	9,000	10,200	10,500	10,600	10,700

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown.

[1] Totals are rounded.

THE MINERAL INDUSTRY OF AFGHANISTAN

By Travis Q. Lyday

The landlocked Islamic Republic of Afghanistan is located in southwest Asia. It is bordered by Pakistan to the east and south, Iran to the west, Turkmenistan to the northwest, Tajikistan and Uzbekistan to the north, and China to the northeast (Countries A to Z, 2005§). Afghanistan's capital city is Kabul. Other major cities include Herat, Kandahar, Konduz, Mazar-e Sharif, and Jalalabad.

Afghanistan is an extremely poor country with rugged terrain and a seasonally harsh climate. The country encompasses an area of approximately 647,500 square kilometers, which is slightly less than that of Texas (U.S. Central Intelligence Agency, 2005§).

Since the fall of the Taliban regime in 2001, Afghanistan's economic outlook has improved significantly owing mainly to the infusion of more than $2 billion in international assistance and the end of a 4-year drought in 2003; drought conditions returned in the southern part of the country in 2004, which negatively affected agricultural production.

Afghanistan's 2003 gross domestic product (GDP) based on purchasing power parity was estimated to be $21.5 billion. The GDP for fiscal year 2004 was estimated to be $5.4 billion, exclusive of illicit opium production (Asian Development Bank, 2005). The estimated GDP growth rate for fiscal year 2004, which ended March 20, 2005, was 7.5%, a decline from 15.7% in fiscal year 2003, and 28.6% in fiscal year 2002. The per capita GDP was estimated to have risen from $199 in fiscal year 2003 to $228 in fiscal year 2004 (Asian Development Bank, 2005).

Afghanistan has economic potential owing to natural resources that range from exotic minerals, such as lapis lazuli, for which the country has been an important source for many centuries, to more common ore deposits, such as copper, gold, and iron ore. The country has numerous precious and semiprecious stone deposits. Some of the main gemstones that have been mined are aquamarine, emerald, kunzite, lapis lazuli, ruby, and tourmaline, most of which were exported to Pakistan (Colored Stone, 2001§). Additional mineral resources include barite, coal, chromite, lead, natural gas, petroleum, salt, sulfur, talc, and zinc. Some of these resources have been exploited in the past, and others have not The country generally lacks the infrastructure to use them and has limited resources under production. A small copper deposit located at Ainak, which is an isolated area in Logar Province, had a production capacity of 5,000 metric tons per year of ore before the Taliban gained control of the county in 1996. The mine has been closed since the ousting of the Taliban. Although a small plant produced minor quantities of cement intermittently, most of the county's cement was imported from Pakistan. The main mineral fuel resources in Afghanistan were coal, natural gas, and petroleum. Afghanistan has tried for many years to bring these fuels into production but has had no discernible success.

The overland transport system in Afghanistan was in poor condition with only about 15% of the 21,000 kilometers (km) of highways paved. Afghanistan had about 1,200 km of inland waterways, which consisted chiefly of the Amu Darya River, which can accommodate vessels that weigh up to 500 deadweight tons. Of the 47 airports in 2004, 10 were principal with permanent-surface runways. Afghanistan had 387 km of gas pipeline in 2004.

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Kabul, Afghanistan
Ministry of Water and Electricity
Kabul, Afghanistan

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[1] References that include a section mark (§) are found in the Internet References Cited section.

THE MINERAL INDUSTRY OF AUSTRALIA

By Travis Q. Lyday

The Commonwealth of Australia is a continent that is part of Oceania, which is located between the Indian Ocean and the South Pacific Ocean. Australia's capital city is Canberra, which is located in the Australian Capital Territory. Other major cities include Adelaide, Brisbane, Darwin, Melbourne, Perth, and Sydney. Australia's total area is 7,686,850 square kilometers (km^2), which is slightly smaller than the contiguous 48 states of the United States. The country's land area is 7,617,930 km^2, and its water area is 68,920 km^2, which includes Lord Howe Island and Macquarie Island. The estimated population in midyear 2004 was 19,913,144 (U.S. Central Intelligence Agency, 2005§[1]).

Australia was one of the world's leading mineral-producing nations in 2004 owing to its large economic demonstrated resources (EDRs) (mineral resources for which profitable extraction or production is possible at current prices). The country was the world's leading producer of lead, nickel, mineral sands, tantalum, uranium, and zinc in 2004. Additionally, Australia's level of EDRs enabled the country to rank among the top six countries worldwide in the production of 12 more mineral commodities—bauxite, black coal, brown coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, niobium, and rare-earth oxides (Geoscience Australia, p. 2005, p. 6).

Australia's real gross domestic product (GDP) grew at an estimated rate of 3.2% in 2004, and the GDP based on purchasing power parity was estimated to be $602.7 billion. The 2004 GDP per capita based on purchasing power parity was estimated to be $29,900 (U.S. Central Intelligence Agency, 2005§). Australia's mineral industry sector contributed about 4% of the GDP. The mineral industry included coal and metal mining, oil and gas extraction, and mining services. The bountiful mineral wealth of Australia enabled the country to be virtually self-sufficient in most mineral commodities. The only significant mineral resource in which Australia was not self-sufficient was petroleum. Australia nevertheless produced an estimated 70% of its crude oil requirements domestically in 2004. Australia also was endowed with abundant resources of other mineral fuels, which included coal, natural gas, liquefied petroleum gas, and uranium, and the country continued to be one of the few market economy countries that was a net exporter of mineral fuels (U.S. Energy Information Administration, 2004§).

The Australian mineral industry provided about 48,000 jobs directly; in total, the mineral industry provided some 240,000 jobs, including many in remote regional areas, such as in ports and towns that were built to support, or were built from the proceeds of, mineral exploration, discovery, and extraction.

Ownership of the mineral rights in Australia generally was vested in the government of the relevant State or Territory or the Commonwealth Government for Federal lands and waters, regardless of ownership or tenure of the surface. Mineral ownership was divided between State ownership in State onshore areas and Commonwealth ownership in Territories and in offshore areas beyond Australia's 4.8-kilometer (km) territorial limit. The Commonwealth's responsibility for minerals, except uranium, in the Northern Territory was, however, transferred to the Government of the Northern Territory. Thus, the individual States and Territories administered the mineral industries within their own borders, which included registering land titles; issuing exploration and development permits; overseeing mining operations, which included administration of inspections; assuring compliance with health, safety, and environmental regulations; and levying royalties and taxes. The Commonwealth may restrict mineral exports for the good of the country and, therefore, has actual control over most mineral production.

Commodity Review

Metals

Bauxite and Alumina and Aluminum.—Australia's aluminum industry was a large integrated sector of mining, refining, smelting, and semi-fabrication that was of major economic import both nationally and globally. The industry consisted of 5 bauxite mines, 7 alumina refineries, 6 primary aluminum smelters, 12 extrusion mills, and 2 rolled-product mills (Geoscience Australia, 2005, p. 17).

Vast resources of bauxite, which are located in the Gove and the Weipa regions adjacent to the Gulf of Carpentaria in the north of Australia and in the Darling Ranges south of Perth, underpin the industry. Bauxite deposits in these regions rank among the world's largest resources of bauxite. Bauxite deposits at Cape Bougainville and Mitchell Plateau in the north of Western Australia are presently uneconomic to develop but may be of potential significance in the future.

Expansion of the Weipa bauxite mining operation was completed and resulted in an increase of production capacity to 16.5 million metric tons per year (Mt/yr). The mining upgrade, which involved a move to simultaneous mining at Weipa's Andoom and east Weipa mines, also involved a change in ore characteristics (fine ore) from that previously being mined (Geoscience Australia, 2005, p. 18).

Alcan announced in late 2004 that it was to proceed with a US$1.3 billion expansion of its Gove alumina refinery in the Northern Territory. This expansion would lift the refinery's 2.1-Mt/yr capacity to about 3.8 Mt/yr (Geoscience Australia, 2005, p. 18).

Australia's aluminum industry was the country's second ranked commodity exporter behind the coal industry when bauxite, alumina, and aluminum are all taken into account. Australia remained the world's top ranking producer of bauxite and alumina for the 34th consecutive year (Plunkert, 2006).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Construction of Comalco Ltd.'s 1.4-Mt/yr alumina refinery at Gladstone, Queensland, was progressing well; the first stage was completed in late 2004 (Geoscience Australia, 2005, p. 18). The refinery was not expected to be completed until late 2006 (Resource Information Unit, 2004, p. 756).

Copper.—Australia continued as a major copper-producing country in 2004, with mining and smelting operations at Mount Isa in Queensland and Olympic Dam in South Australia. Other major copper mines included Northparkes and Tritton in New South Wales; Ernest Henry, Mt. Gordon, and Osborne in Queensland; Golden Grove and Nifty in Western Australia; and Mt. Lyell in Tasmania. Australia's mined copper production ranked fourth in the world following Chile, the United States, and Peru (Edelstein, 2006).

Copper and copper alloys were used in building and construction, in such electrical equipment as electrical cables, and in industrial machinery and equipment. The Mount Isa Mine at Mount Isa, Queensland, produced large tonnages of lead, silver, and zinc and remained the leading copper producer in Australia. It was Australia's largest underground operation (Resource Information Unit, 2004, p. 131).

Gold.—Australia again ranked second after the Republic of South Africa in gold production during 2004. Australia placed second in gold production in 2004 by mining one more metric ton (t) of gold than the United States for a total annual gold production of 259 t; the United States produced 258 t. Australia accounted for about 11% of world output in 2004, which was unchanged from 2003 (George, 2006).

Australia's gold resources occur and are mined in all States and in the Northern Territory. Western Australia, however, was by far the leading producer. Much of the gold mined in Australia in 2004 was from large open pit mines and was invisible to the unaided eye.

Iron Ore.—Although iron ore resources occurred in all six Australian States and the Northern Territory, Western Australia had almost all the country's EDR; about 92% of these resources occur in Western Australia's Pilbara District. The major iron ore producers in the Pilbara District were BHP Billiton Ltd., Hamersley Iron Pty. Ltd, Rio Tinto Ltd., and Robe River Iron Associates, which was a joint venture of Mitsui Iron Ore Development Pty., Nippon Steel Australia Pty., Rio Tinto Ltd., and Sumitomo Metals Australia Pty. Ltd. In 2004, Australia ranked third following China and Brazil in iron ore production and produced about 17% of world production (Jorgenson, 2006).

Onesteel Ltd., which was created when BHP Billiton divested some of its steel assets, operated the Whyalla Mines (formerly Middleback Range), which are located about 50 km west of Whyalla and 270 km northwest of the State capital, Adelaide, in South Australia. The Middleback Range mines (Iron Baron, Iron Duchess, Iron Duke, Iron Knob, and Iron Prince Mines), have been an important source of iron ore for Onesteel's domestic steel product requirements. Mining in the South Middleback ranges began first at Iron Duke in 1989 and was followed by mining at the Iron Duchess in 1998 and the Iron Prince in 1999. Mining operations were contracted out to Henry Walker Eltin Ltd. in 1997. Because of the near depletion of iron ore resources at Iron Knob and Iron Baron, Onesteel constructed a low-grade beneficiation plant to turn waste dump into ore; the plant began production early in 2004 (Resource Information Unit, 2004, p. 180).

Lead, Silver, and Zinc.—Australia's lead, silver, and zinc mines were predominantly based on zinc-rich ore bodies with zinc as the major component and lead and silver as byproducts. An exception was BHP Billiton's Cannington underground mine in Queensland. It was based on a lead-silver ore body with zinc as a byproduct. In 2004, following a major production expansion to 2.4 Mt/yr, the Cannington Mine remained the world's leading single producer of silver in the world and a leading producer of lead (Resource Information Unit, 2004, p. 154). In 2004, Australia was the second ranked producer of lead after China and the fourth ranked silver producer following Peru, Mexico, and China (Brooks, 2006; Gabby, 2006).

Mining for lead, which was the first metal mined in Australia, was begun in 1841 at Glen Osmond, South Australia. Lead-silver ore was discovered and mined near Broken Hill, New South Wales, in 1876 and, in 1883, the large lead-zinc-silver deposit at Broken Hill proper was discovered, which provided the basis for Australia's zinc mining industry up to the present.

Manganese.—Australia had two operating manganese mines in 2004: Groote Eylandt Mining Co. Pty. Ltd.'s mine on the 84-km^2 Groote Island in the Northern Territory and Woodie Woodie, which is located 400 km southeast of Port Hedland in Western Australia. A third mine, the Bootu Creek, began construction in October 2004 at Bootu Creek, which is located 130 km north of Tenant Creek in the Northern Territory. The project was scheduled to produce 415,000 metric tons per year (t/yr) of lump and 130,000 t/yr of fine products beginning in mid-2005 (Resource Information Unit, 2004, p. 108; Geoscience Australia, 2005, p. 46). The operations at Groote Island used excavators and 145-t end-dump trucks for removal of overburden and ore mining. The manganese ore mined at Groote Island was processed in plants at Bell Bay, Tasmania, and Newcastle, New South Wales. Australia produced 13% of the world's manganese ore in 2004 and ranked third behind China, and South Africa (16% each) (Geoscience Australia, 2005, p. 46).

Nickel.—Australia's main nickel ores were primary sulfides of nickel, which occur as lodes within mafic and ultramafic (iron- and magnesium-rich) igneous rocks that have a volcanic origin, although most of the world's identified resources are contained in nickel-bearing laterite and nickeliferous limonite. These secondary deposits are derived from the weathering of nickel-bearing mafic and ultramafic rocks in tropical and subtropical climates.

Western Australia had the largest nickel resources in Australia. Active mining of nickel was conducted at the sulfide mines of WMC Resources Ltd.'s Leinster and Mount Keith Mines; LionOre Mining International Ltd.'s Black Swan and Emily Ann Mines; Jubilee Mines NL's Cosmos Mine; and Mincor Resources NL's Miitel and Wannaway Mines. Production commenced at Mincor's Redross Mine in September and at Sally Malay Mining Ltd.'s Sally Malay Mine in August 2004 (Geoscience Australia, 2005, p. 52). Sulfide nickel production continued or commenced at eight other mostly small mines in 2004. Mining of lateritic nickel continued from Minara Resources Ltd.'s Murrin Murrin Mine and from Om Group Inc.'s Cawse Mine (Resource Information Unit, 2004, p. 352).

Tin.—Marlborough Resources NL's Ardlethan Mine in central New South Wales was Australia's only operating tin mine. The operation was an alluvial mine that used alluvial leads that emanate from the hard granite outcrops that contain separate ore horizons. Ardlethan shipped its concentrate to Malaysian Smelting Corp. in Penang, Malaysia, for processing (Resource Information Unit, 2004, p. 93).

Titanium.—Mineral sands deposits are concentrations of ilmenite, rutile, and zircon, which occur along the coast of eastern Australia from central New South Wales to Cape York in Queensland. Large relic beach deposits are found as far inland as Ouyen in Victoria, in southwestern New South Wales, and in South Australia in more than 300,000 km^2 of the Murray Basin. In Western Australia, deposits are distributed from the southern tip of the State to Geraldton and are located at the coastline or as relic deposits up to 35 km inland. The eastern deposits generally have a total heavy-mineral content of from 1% to 5%; ilmenite, rutile, and zircon each make up about one-third. In Western Australia, the deposits also have a total heavy-mineral content of about the same or slightly higher percentage, but the ilmenite portion of this content approaches about 70%. Australia had a substantial portion of world mineral sands resources—about 32% for ilmenite, 45% for rutile, and up to 45% for zircon (Geoscience Australia, 2005, p. 48).

Industrial Minerals

Diamond.—In 2004, only two diamond mines were operating in Australia: Rio Tinto's huge Argyle open cut in the Ellendale diamond province of the western Kimberley region of Western Australia and Kimberley Diamond Co.'s. Ellendale Mining Lease, which is located about 200 km to the southeast of the Argyle Mine. Mining at Argyle began in December 1985 from the AK1 lamproite pipe. Alluvial mining operations had begun in 1983 and continued through 2001. The life of the open cut at Argyle was thought to extend to 2007, but because the AK-1 pipe continued at depth, underground mining possibly could extend the mine life to 2020. Diamond recovered from the Argyle Mine was sorted in Perth, where it was prepared for international sale at Argyle's European sales office in Antwerp, Belgium (Resource Information Unit, 2004, p. 217).

Mineral Fuels

Coal.—In 2004, Australia again was the world's leading exporter of coal, as it has been since 1984, thus marking its 20th consecutive year.

Petroleum and Natural Gas.—In 2004, Western Australia and the adjacent Commonwealth offshore areas accounted for about 55% of Australia's total oil and condensate and all the country's liquefied natural gas (LNG) production. Apart from having the appropriate geology, the State's large output is owing to its enormous size onshore and offshore. Onshore Western Australia has a land area of more than 2.5 million square kilometers, which is nearly four times the size of Texas. Additionally, the State's offshore area encompasses an area that is nearly four times larger than Europe's North Sea and is larger than North America's entire Gulf of Mexico.

In 2004, Australia produced about 70% of its crude oil requirements. Australia's expanding oil deficit was primarily a result of demand steadily outpacing supply. The Australian Government has estimated that the country was using its crude petroleum about three times faster than exploration projects were discovering new production fields. By 2010, Australia was expected to slide downward to only 40% self-sufficiency (U.S. Energy Information Administration, 2004§).

Australia has 10 crude oil refineries with a total crude oil distillation capacity of 846,250 barrels per day (bbl/d). The country's three leading facilities were BP p.l.c.'s Kwinana Refinery in Western Australia with a capacity of 158,500 bbl/d of crude oil, Exxon Mobil Corp.'s Altona Refinery in Victoria with a capacity of 130,000 bbl/d of crude oil, and Chevron Texaco Corp.'s Kurnel Refinery in New South Wales with a capacity of 114,000 bbl/d of crude oil (U.S. Energy Information Administration, 2004§).

Uranium.—Australia had three active uranium mining operations in 2004—Energy Resources of Australia Ltd.'s (ERA) Ranger open pit mine in the Northern Territory, which was the oldest of the active mines; Heathgate Resources Pty. Ltd.'s Beverley in situ leach (ISL) operation in South Australia, which was the latest of the active uranium mines to come onstream; and WMC's Olympic Dam underground copper-silver-gold-uranium mine, also located in South Australia. Because Australia has no significant national demand for uranium, virtually all production was exported. Uranium oxide, or yellowcake, exports were made only under close supervision and in accordance with stringent international and bilateral regulations to ensure that it would be used only for peaceful purposes. The Beverley Mine, which was South Australia's second uranium mine, was opened in 2001, although it had begun production in 2000 after receiving all environmental approvals needed to proceed. The uranium was extracted by the ISL mining process, which enabled the resource to be recovered without major impact on the environment. The Beverley Mine was expected to produce about 1,000 t/yr of yellowcake for about 15 years, although ongoing exploration on surrounding leases was expected to extend the mine life. After being trucked to Port Adelaide, the yellowcake was shipped to the United States under sales agreements with nuclear power utilities. Heathgate Resources was a subsidiary of General Atomics, which was a uranium miner, processor, and nuclear power station designer headquartered in the United States.

The Olympic Dam uranium operation included a fully integrated metallurgical complex with a grinding/concentrating circuit and a hydrometallurgical plant that incorporated a solvent extraction circuit for the production of about 4,300 t/yr of yellowcake. The bulk of the uranium production was committed under long-term sales contracts with electricity-generating facilities in Belgium, Canada, Finland, France, Japan, the Republic of Korea, Sweden, the United Kingdom, and the United States. First production of yellowcake from the Ranger Mine was in August 1981, and the life of the mine was anticipated to end in 2007, with processing of Ranger ore expected to be completed during 2010. All ERA's yellowcake sales were to energy companies in France, Germany, Japan, the

Republic of Korea, Spain, Sweden, the United Kingdom, and the United States.

Infrastructure

The transportation infrastructure of Australia was well developed. Of the 913,000 km of roads, 353,331 km, which included 1,363 km of expressways, was paved, and 559,669 km was unpaved. Inland waterways, of which 8,368 km was usable mainly by small shallow-draft craft, were of little importance to the transportation industry. The public sector railway system consisted of 46,200 km of track, of which 23,648 km was standard (1.435-m) gauge, 15,456 km was narrow (1.067-m) gauge, 2,193 km was broad (1.600-m) gauge, and 291 km was dual gauge. Australia had 4,612 km of electrified rail. Additionally, a few hundred kilometers of rail were privately owned; most of this served the iron ore industry in Western Australia. Of the 444 airports in 2002, 294 were principal with permanent-surface runways. International shipping ports included Adelaide, Brisbane, Cairns, Darwin, Devonport (Tasmania), Esperance, Fremantle, Geelong, Hobart (Tasmania), Launceston (Tasmania), Mackay, Melbourne, Sydney, and Townsville. The merchant marine fleet included 7 petroleum-oil-lubricant tankers; 3 chemical tankers; 4 LNG tankers; 35 bulk roll-on/off cargo-container freighters; and 2 passenger vessels. Pipelines included 5,600 km for natural gas, 2,500 km for crude oil, and 500 km for refined petroleum products (U.S. Central Intelligence Agency, 2005§).

Electricity-generating capacity was 43 gigawatts, of which 84% was thermal (mostly coal) and 14% was hydroelectric power (U.S. Energy Information Administration, 2004§).

Outlook

Australia continued in its position as one of the world's leading mineral-producing nations in 2004. This position was expected to hold well into the future owing to the country's large EDRs, especially bauxite, gold, iron ore, lead, mineral sands, nickel, silver, tantalum, uranium, and zinc.

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TABLE 1
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
METALS						
Aluminum:						
Bauxite, gross weight	thousand metric tons	53,802	53,799	54,135	55,602	43,993 [2]
Alumina	do.	15,680	16,313	16,382	16,529	16,525 [2]
Metal, refined:						
Primary	do.	1,769	1,798	1,817	1,857	1,900 [2]
Secondary[e]		110,000	127,000 [2]	127,000 [2]	127,000 [r]	127,000
Antimony, Sb content of ores and concentrates		1,511	1,380	1,200 [e]	900 [e]	120 [2]
Cadmium:						
Mine output, Cd content[e]		1,900	1,900	1,900	1,900	1,900
Metal, smelter, refined		552	378	370	350	469
Chromium, chromite, gross weight		90,000	11,800	132,665	138,826	140,000 [e]
Cobalt:						
Co content in laterite ore, Ni concentrate, and Zn concentrate		5,600	6,200	6,500	7,000	7,000 [e]
Metal, refined		2,610	3,470	3,500 [e]	3,840	3,900 [e]
Columbium (niobium) and tantalum, columbium-tantalum concentrate, gross weight		1,600	2,220	3,100	2,500 [r]	2,500 [e]
Copper:						
Mine output, Cu content	thousand metric tons	832	873	883	830	656 [2]
Metal:						
Smelter, primary	do.	387	456	469	435	443 [2]
Refined, primary	do.	484	558	543	484	383 [2]
Gold:						
Mine output, Au content	kilograms	296,410	285,030	273,010	282,000	259,000 [2]
Metal, refined:						
Primary	do.	349,000	304,770	300,000 [e]	252,000	230,000 [2]
Secondary	do.	7,640	68,310	68,000 [e]	100,000 [e]	54,000 [2]
Iron and steel:						
Iron ore:						
Gross weight	thousand metric tons	171,508	181,553 [r]	182,704	187,219	230,955 [2]
Fe content	do.	106,563	112,592	113,548	116,355	143,980 [2]
Metal:						
Pig iron	do.	7,000 [e]	7,200	8,574	9,660	9,700 [e]
Ferroalloys:[e]						
Ferromanganese		115,000	115,000	115,000	115,000	115,000
Silicomanganese		135,000	135,000	135,000	135,000	135,000
Total		250,000	250,000	250,000	250,000	250,000
Steel, crude	thousand metric tons	7,297	7,076	8,242	9,660	8,411 [2]
Semimanufactures[e]		5,000	5,000	5,000	5,000	5,000
Lead:						
Mine output, Pb content	thousand metric tons	739	714	683	688	678 [2]
Metal:						
Primary:						
Bullion	do.	139	195	181	169	--
Refined	do.	223	237	287	310 [r]	266 [2]
Total	do.	362	432	468	479 [r]	266 [2]
Secondary excluding remelt	do.	223 [r]	237 [r]	393 [r]	340 [r]	340 [2]
Manganese ore, metallurgical:						
Gross weight	do.	1,613	2,069	2,187	2,555	2,560 [e]
Mn content	do.	787	948	983	1,247	1,327 [2]
Nickel:						
Mine output, Ni content	do.	166	205	208	179	178 [2]
Metal, smelter, refined Ni and Ni content of oxide	do.	112	128	133	209	185 [2]
Platinum-group metals:						
Palladium, Pd content	kilograms	812	828	800 [e]	820 [e]	800 [e]
Platinum, Pt content	do.	171	174	200 [e]	225 [e]	200 [e]
Total	do.	983	1,002	1,000 [e]	1,050 [e]	1,000 [e]

See footnotes at end of table.

TABLE 1--Continued
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
METALS--Continued						
Silver:						
Mine output, Ag content		2,060	1,970	2,077	1,868	2,237 [2]
Metal, refined		538	576	542	227	650 [2]
Tin:						
Mine output, Sn content		9,146	9,802	6,268	3,819	1,306 [2]
Metal, refined:						
Primary		733	1,094	611	597	467 [2]
Secondary[e]		300	400	400	400	400
Titanium concentrates, gross weight:						
Ilmenite	thousand metric tons	2,146	2,017	1,917	2,006	1,921 [2]
Leucoxene		27,000	30,000	39,000	57,000	44,000 [2]
Rutile		208,000	206,000	218,000	173,000	162,000 [2]
Zinc:						
Mine output, Zn content	thousand metric tons	1,420	1,519	1,469	1,479	1,334 [2]
Metal, smelter:						
Primary	do.	490	554	567	553	473 [2]
Secondary[e]		4,500	4,500	4,500	4,500	4,500
Zirconium concentrates, gross weight	thousand metric tons	374	394	412	462	439 [2]
INDUSTRIAL MINERALS						
Abrasives, natural:[e]						
Beach pebble		2,000	2,000	2,000	2,000	2,000
Garnet		25,000	25,000	25,000	25,000	25,000
Barite[e]		20,000	20,000	20,000	20,000	20,000
Cement, hydraulic[e]	thousand metric tons	7,500	7,500	7,550	8,000	8,000
Clays:[e]						
Bentonite and bentonitic clay		180,000	180,000	200,000	200,000	200,000
Brick clay and shale	thousand metric tons	8,000	8,000	8,000	8,000	8,000
Cement clay and shale	do.	500	500	500	500	500
Damourite clay		100	100	100	100	100
Fire clay		25,000	25,000	25,000	25,000	25,000
Fuller's earth, attapulgite		5,600	5,600	6,000	6,000	6,000
Kaolin and ball clay		220,000	220,000	230,000	240,000	240,000
Other	thousand metric tons	1,000	1,000	1,000	2,000	2,000
Diamond:						
Gem	thousand carats	14,656	14,397	15,136	13,981	20,602 [2]
Industrial	do.	11,992	11,779	18,500	17,087	22,709
Total	do.	26,648	26,176	33,636	31,068	43,311
Diatomite[e]		20,000	20,000	20,000	20,000	20,000
Feldspar, including nepheline syenite[e]		50,000	50,000	50,000	50,000	50,000
Gemstones, other than diamond:						
Opal	value, $million	60	53	47	50	36 [2]
Sapphire	do.	6	5	1	--	-- [2]
Total	do.	66	58	48	50	36 [2]
Gypsum[e]	thousand metric tons	2,500	3,800	3,800	4,000	4,500
Kyanite[e]		1,000	1,000	1,000	1,000	1,000
Lime[e]		1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Magnesite		349,783	605,314	484,314	472,668	473,983 [2]
Nitrogen, N content of ammonia		575,500	762,200	686,400	786,800 [r]	790,000
Perlite, crude[e]		5,000	5,000	5,000	5,000	5,000
Phosphate rock	thousand metric tons	2,108	977,100	2,024,580	2,100,000 [e]	2,200,000 [e]
Salt	do.	8,798	9,536	10,000 [e]	10,400 [e]	11,221 [2]
Sillimanite[e, 3]		300	300	300	300	300
Spodumene, concentrate		81,891	63,443	100,000 [e]	110,000 [e]	110,000 [e]
Stone and sand and gravel:[e]						
Construction sand	thousand metric tons	33,000	35,000	38,000	40,000	40,000
Gravel	do.	15,000	15,000	15,000	20,000	20,000
Dolomite	do.	10,000	10,000	10,000	10,000	10,000

See footnotes at end of table.

TABLE 1--Continued
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[p]
INDUSTRIAL MINERALS--Continued						
Stone and sand and gravel--Continued:[e]						
Limestone, for cement	do.	6,000	6,000	10,000	10,000	10,000
Limestone, for other uses	do.	6,000	6,000	10,000	10,000	10,000
Silica in the form of quartz, quartzite, glass sand	do.	4,266	4,500	4,500	5,000	5,000
Other:						
Crushed and broken stone	do.	80,000	80,000	80,000	80,000	80,000
Dimension stone	do.	120	120	120	120	120
Unspecified	do.	30,000	30,000	30,000	30,000	30,000
Sulfur, byproduct:						
Metallurgy	do.	654	817	899	900	900
Petroleum	do.	30	45	60	60	60
Total	do.	684	862	959	960	960
Talc, chlorite, pyrophyllite, steatite		180,272	174,946	172,241	174,000 [e]	174,000 [e]
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous and subbituminous	thousand metric tons	245,500	264,680	347,890	257,790	257,790
Lignite[e]	do.	67,000	70,000	73,000	67,000	67,000
Total[e]	do.	313,000 [r]	335,000 [r]	421,000 [r]	325,000	325,000
Coke, metallurgical[e]	do.	325	800 [r]	300	300	300
Fuel briquets[e]	do.	750	470 [r]	800	800	470
Gas, natural, marketed[e]	million cubic meters	30,794 [2]	30,000	31,000	30,000	30,000
Natural gas liquids[e]	thousand 42-gallon barrels	47,260 [2]	47,000	47,300	47,000	50,000
Peat[e]		5,000 [r]	5,000 [r]	5,000 [r]	5,000 [r]	6,000
Petroleum:						
Crude	thousand 42-gallon barrels	263,500	231,000	240,000 [e]	250,000 [e]	250,000 [e]
Refinery products:						
Gasoline:						
Aviation	do.	975	868	900 [e]	950 [e]	950 [e]
Motor	do.	113,228	112,767	113,000 [e]	115,000 [e]	115,000 [e]
Jet fuel	do.	35,585	362,138	363,000 [e]	365,000 [e]	365,000 [e]
Kerosene	do.	147	245	250 [e]	300 [e]	300 [e]
Distillate fuel oil	do.	80,222	84,862	85,000 [e]	85,000 [e]	85,000 [e]
Residual fuel oil	do.	12,442	12,132	12,100 [e]	12,000 [e]	12,000 [e]
Lubricants	do.	4,284	3,950	4,000 [e]	4,000 [e]	4,000 [e]
Liquefied petroleum gas	do.	10,536	11,145	11,200 [e]	115,000 [e]	115,000 [e]
Bitumen	do.	4,328	4,610	5,000 [e]	5,000 [e]	5,000 [e]
Unspecified	do.	7,574	4,654	5,000 [e]	5,000 [e]	5,000 [e]
Total[4]	do.	269,321	597,371	599,000 [e]	707,000 [r, e]	707,000 [e]
Uranium, mine output, U_3O_8 content		7,588 [5]	7,680 [5]	3,536	8,912	8,912

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p] Preliminary. [r] Revised. -- Zero.

[1] Includes data available through October 14, 2005.

[2] Reported figure.

[3] In addition, about 7,000 metric tons per year of sillimanite clay (also known as kaolinized sillimanite) that contains from 40% to 48% aluminum oxide is produced.

[4] Excludes refinery fuel and losses.

[5] U content.

TABLE 2
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Alumina	Queensland Alumina Ltd., operator [Rio Tinto Ltd., 30.3%; Kaiser Aluminum and Chemical Corp. (Australia) Ltd., 28.3%; Alcan South Pacific Pty. Ltd., 21.4%; Pechiney Australia Pty. Ltd., 20%]	Gladstone alumina refinery, QLD	3,800
Do.	Alcan Northern Territory Pty. Ltd., 70%, and Alcan South Pacific Pty. Ltd., 30%	Gove alumina refinery, NT	1,900
Do.	Alcoa World Alumina Australia, 100%	Kwinana alumina refinery, WA	2,100
Do.	do.	Pinjarra alumina refinery, WA	3,400
Do.	Alcoa World Alumina Australia, 60%, and Western Mining Corp., 40%	Wagerup alumina refinery near Waroona, WA	2,200
Do.	Worsley Alumina Pty. Ltd., manager [Billiton Aluminium Australia Pty. Ltd., 86%; Billiton Plc, 30%; Kobe Alumina Associates (Australia) Pty. BHP Ltd., 10%; Nissho Iwai Alumina Pty. Ltd., 4%]	Worsley alumina refinery, 20 km NW of Collie, WA	3,200
Aluminum	Comalco Aluminium (Bell Bay) Ltd., 100%	Bell Bay aluminum smelter, TAS	142
Do.	VAW Kurri Kurri Pty. Ltd., 100%	Kurri Kurri aluminum smelter, NSW	150
Do.	Boyne Smelters Ltd., operator (Rio Tinto Ltd., 64%; Sumitomo Light Metal Industries Ltd., 17%; Ryowa Development Pty. Ltd., 12%, Kobe Steel Ltd., 5%; Sumitomo Chemical Co. Ltd., 2%)	Boyne Island aluminum smelter, QLD	490
Do.	Alcoa of Australia, 100%	Point Henry aluminum smelter, VIC	185
Do.	Alcoa of Australia, 45% and manager; China International Trust Investment Co. (a Chinese Government agency), 2.5%; Marubeni Australia Pty. Ltd., 22.5%; Eastern Aluminum Ltd., 10%	Portland aluminum smelter, VIC	345
Do.	Tomago Aluminium Co. Pty. Ltd., operator (Gove Aluminium Finance Ltd., 36%; Pechiney Australia Pty. Ltd., 36%; Australian Mutual Provident Society, 16%; VAW Australia Pty. Ltd., 12%)	Tomago aluminum smelter, NSW	444
Antimony	New England Antimony Mines NL, 100%	Hillgrove underground antimony-gold mine, 25 km E of Armidale, NSW	4
Bauxite	Alcan Inc., 100%	Gove open pit bauxite mine, Gove Peninsula, NT	7,000
Do.	Alcoa World Alumina Australia, 100%	Huntly open pit bauxite mine, 80 km S of Perth, WA	20,000
Do.	Comalco Ltd., operator (Rio Tinto Plc, 100%)	Weipa-Andoom open pit bauxite mine, Weipa, QLD	12,000
Do.	do.	Willowdale open pit bauxite mine, 130 km S of Perth, WA	8,600
Do.	Worsley Alumina Pty. Ltd., manager [BHP Billiton Ltd., 86%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; Nissho Iwai Alumina Pty. Ltd., 4%]	Worsley open pit bauxite mine, 50 km NE of Collie, WA	11,000
Bentonite	Arumpo Bentonite Pty. Ltd., 100%	Arumpo open pit bentonite mine, 95 km NE of Mildura, NSW	10
Do.	Unimin Australia Ltd., 100%	Cressfield open pit bentonite mine, 20 km N of Scone, NSW	12
Do.	do.	Miles open pit bentonite mine, 350 km W of Brisbane, QLD	100
Cement	Blue Circle Southern Cement Ltd., 100%	Berrima Cement Plant, NSW	1,200
Do.	Adelaide Brighton Cement Ltd., 100%	Birkenhead Cement Plant, SA	1,000
Do.	Queensland Cement Ltd., 100%	Darra Cement Plant, QLD	700
Do.	Adelaide Brighton Cement Ltd., 100%	Geelong Cement Plant, VIC	800
Do.	Goliath Cement Holdings Ltd., 100%	Railton Cement Plant, TAS	1,000
Do.	Cockburn Cement Ltd., 100%	South Coogee Cement Plant, WA	1,000
Chromite	Sylvania Resources Ltd., 100%	Coobina open pit chromite mine, 56 km ESE of Newman, WA	100
Coal, black	Powercoal Pty. Ltd., 100%	Angus Place longwall coal mine, 16 km NW of Lithgow, NSW	2,200

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Coal, black--Continued:	BHP Steel (AIS) Pty. Ltd., 100%	Appin longwall coal mine, 40 NW of Wollongong, NSW	3,300
Do.	Powercoal Pty. Ltd., 100%	Awaba underground coal mine, 30 km SW of Newcastle, NSW	2,000
Do.	Oakbridge Pty. Ltd., 95%, and Sumitomo Corp., 5%	Baal Bone longwall coal mine, 24 km NW of Lithgow, NSW	3,500
Do.	BHP Billiton Hunter Valley Energy Coal, 100%	Bayswater open pit coal mine, 33 km NW of Singleton, 13 km SSW of Muswellbrok, NSW	5,500
Do.	Coal and Allied Industries Ltd., 40% and manager (Wesfarmers Bengalla Ltd., 40%; MCDA Bengalla Investment Pty. Ltd., 10%; Taipower Bengalla Pty. Ltd., 10%)	Bengalla open pit coal mine, 5 km W of Muswellbrook, NSW	5,000
Do.	Berrima Coal Pty. Ltd., 100%	Berrima underground coal mine, 60 km NE of Goulburn, NSW	2,000
Do.	BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	Blackwater open pit coal mine (includes South Blackwater), 195 km W of Rockhamton, QLD	13,500
Do.	Xstrata Coal Australia Pty. Ltd., manager (Oakbridge Pty. Ltd., 87.5%, and Nippon Steel Australia Pty. Ltd., 12.5%)	Bulga open pit/longwall coal mine, 16 km SW of Singleton, NSW	11,000
Do.	Pacific Coal Pty. Ltd., 57.195% and manager [Leichhardt Coal Pty. Ltd., 31.419%; EPDC (Australia) Pty. Ltd., 7.9723%; and Japan Coal Development Co. Ltd., 3.416%]	Blair Athol open pit coal mine, 110 km NW of Emerald, 25 km NW of Clermont, QLD	11,000
Do.	Bloomfield Collieries Pty. Ltd., 100%	Bloomfield open pit coal mine, 20 km NW of Newcastle, 5 km SE of Maitland, NSW	1,300
Do.	Anglo Coal Holdings Australia Ltd., 100%	Boundary Hill open pit coal mine (includes Callide), 115 km to 140 km W of Gladstone, QLD	7,250
Do.	RAG Australia Pty. Ltd., manager (Burton Coal Pty. Ltd., 95%, and Thiess Pty. Ltd., 5%)	Burton open pit coal mine, 150 km SW of Mackay, QLD	5,800
Do.	Camberwell Coal Pty. Ltd., manager [Toyota Tsusho Mining (Australia) Pty. Ltd., 90%, and Dia Coal Mining (Australia) Pty. Ltd., 10%]	Camberwell open pit coal mine, 10 km NW of Singleton, NSW	4,000
Do.	LakeCoal Pty. Ltd., 80%, manager; Catherine Hill Resources Pty. Ltd., 20%	Chain Valley underground coal mine, 48 km S of Newcastle, NSW	3,000
Do.	Centennial Coal Co. Ltd., 85%, manager; SK Australia Pty. Ltd., 15%	Clarence underground coal mine, 10 km E of Lithgow, NSW	2,200
Do.	Roche Mining Pty. Ltd., operator (Millmerran Power Partners, 100%)	Commodore open pit coal mine, 80 km S of Toowoomba, QLD	3,600
Do.	Xstrata Coal Australia Pty. Ltd., 50%; Centennial Coal Co. Ltd., 45%; Tokyo Boeki Ltd., 5%	Cook underground coal mine, near Blackwater, QLD	1,000
Do.	Powercoal Pty. Ltd., 100%, manager	Cooranbong underground coal mine, 35 km SW of Newcastle, NSW	1,600
Do.	Australian Premium Coals Pty. Ltd., manager (Macarthur Coal Ltd., 45%; QCR No. 2 Pty. Ltd., 20%; CPB Coals Pty., 10%; Marubeni Coal Pty. Ltd., 7.5%; Nissho Iwai Australia Ltd., 7.5%; Citic Australia Coal Ltd., 5%; Kawasho Group, 3%; Nittetsu Shoji, 2%)	Coppabella open pit coal mine, 150 km SW of Mackay, QLD	4,700
Do.	BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	Crinum longwall coal mine, 45 km NE of Emerald, QLD	4,000
Do.	Cumnock No. 1 Colliery Pty. Ltd., 100%	Cumnock No. 1 open pit/longwall coal. 28 km NW of Singleton, NSW	2,750
Do.	Curragh Queensland Mining Ltd., 100%	Curragh open pit coal mine, 70 km E of Emerald, QLD	5,000
Do.	Anglo Coal Holdings Australia Ltd., 93%, and Ssangyong Resources Ltd., 7%	Dartbrook longwall coal mine, 70 km N of Singleton, NSW	3,750
Do.	BHP Billiton Ltd., 100%	Dendrobium longwall coal mine, 15 km SW of Wollongong, NSW	5,200
Do.	Anglo Coal Holdings Australia Ltd., 88.2% and manager; Mitsui Coal Development Australia Pty. Ltd., 3.8%; Mitsui Mining (Australia) Pty. Ltd., 3%; Daesung Australia Pty. Ltd., 2.5%; and Hyundai (Australia) Pty. Ltd., 2.5%	Drayton open pit coal mine, 35 km NW of Singleton, NSW	5,000

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Coal, black--Continued:	Ebenezer Mining Co., 100%	Ebenezer open pit coal mine, 40 km SW of Brisbane, QLD	1,500
Do.	BHP Steel (AIS) Pty. Ltd.	Elouera longwall coal mine, 15 km SW of Wollongong, NSW	2,000
Do.	Idemitsu Kosan Co. Ltd., 85%; EPDC (Australia) Pty. Ltd., 10%; LG International (Australia) Pty. Ltd., 5%	Ensham-Yongala open pit coal mine, 40 km NE of Emerald, QLD	5,500
Do.	Griffin Coal Mining Co. Pty. Ltd., 100%	Ewington II open pit coal mine, 8 km E of Collie, WA	1,000
Do.	CAML Resources Pty. Ltd., 63%; Itochu Corp., 20.6%; Bowen Basin Investments Pty. Ltd., 16.4%	Foxleigh open pit coal mine, Bowen Basin, QLD	2,300
Do.	Anglo Coal Holdings Australia Ltd., 100% of German Creek and 75.04% of German Creek East; Marubeni Coal Pty. Ltd., 24.96% of German Creek East	German Creek and German Creek East open pit/longwall coal mines, 275 km WNW of Rockhampton, QLD	6,000
Do.	Console Energy Inc., 50% and Namoi Hunter Pty. Ltd., 50%	Glennies Creek longwall coal mine, 12 km N of Singleton, NSW	2,500
Do.	BHP Billiton Ltd., 80% at Riverside and 50% at Goonyella; Mitsubishi Corp., 50% at Goonyella; BHP Mitsui Coal Pty. Ltd., 20% at Riverside	Goonyella-Riverside open pit coal mines, 140 km SW of Mackay, QLD	11,000
Do.	BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	Gregory open pit coal mine, 60 km N of Emerald, QLD	5,500
Do.	Coal and Allied Industries Ltd., 100%, manager	Hunter Valley Operations (includes Carrington Chestnut, Howick, Hunter Valley No. 1, Lemington, Riverview open pit coal mines), 10 km W to 25 km N of Singleton, NSW	15,000
Do.	New Hope Corp. Ltd., 100%	Jeebropilly open pit coal mine, 35 km SW of Brisbane, QLD	1,500
Do.	Queensland Coal Mine Management Pty. Ltd., 70%; Winnin Pty. Ltd., 15%; Marubeni Coal Pty. Ltd., 15%	Jellinbah East open pit coal mine, 90 km E of Emerald, QLD	3,000
Do.	Pacific Coal Pty. Ltd., 80%, and Kestrel Coal Investment Pty. Ltd., 20%	Kestrel longwall coal mine, 40 km NNE of Emerald, QLD	3,300
Do.	Xstrata Coal Australia Pty. Ltd., 67%, and Mitsui Matushima Australia Pty. Ltd., 32.5%	Liddell open pit coal mine, 25 km NW of Singleton, NSW	4,000
Do.	Burragorang Valley Coal Pty. Ltd., 100%	Metropolitan longwall coal mine, 30 km N of Wollongong, NSW	1,400
Do.	LakeCoal Pty. Ltd., 80%, and Catherine Hill Resources Pty. Ltd., 20%	Moonee longwall coal mine, 37 km S of Newcastle, NSW	1,200
Do.	Anglo Coal Holdings Australia Ltd., 88%; Nippon Steel Australia Pty. Ltd., 5%; Tomen Coal Resources Pty. Ltd., 3.75%; private interests, 3.25%	Moranbah North longwall coal mine, 150 km SW of Mackay, QLD	5,700
Do.	Hunter Valley Coal Corp., 100%	Mount Owen open pit coal mine, 20 km NW of Singleton, near Ravensworth, NSW	8,000
Do.	Coal and Allied Industries Ltd., 80%, and Pohang Steel Australia Pty. Ltd., 20%	Mount Thorley open pit coal mine, 14 km SW of Singleton, NSW	6,500
Do.	Mitsui & Co. (Australia) Ltd., 100%	Moura open pit coal mine, 185 km W of Gladstone, QLD	4,400
Do.	The Griffin Coal Mining Co. Pty. Ltd., 100%	Muja open pit coal mine, 18 km SE of Collie, WA	2,000
Do.	Powercoal Pty. Ltd., 100%	Munmorah underground coal mine, 55 km S of Newcastle, NSW	7,000
Do.	Muswellbrook Coal Co., 100%	Muswellbrook No. 2 open pit coal mine, 4 km NE of Muswellbrook, Hunter Valley NSW	1,700
Do.	Powercoal Pty. Ltd., 100%	Myuna underground coal mine, 35 km S of Newcastle, NSW	1,500
Do.	Nardell Coal Corp., 100%	Nardell underground coal mine, 18 km NW of Singleton, NSW	1,200
Do.	MIM Holdings Ltd., manager (Collinsville Coal Co. Pty. Ltd., 75%, and Itochu Coal Resources Australia Pty. Ltd., 25%)	Newlands-Collinsville-Abbot Point open pit/longwall coal mine, 130 km west of Mackay, QLD	7,000
Do.	Powercoal Pty. Ltd., 100%, manager	Newstan longwall coal mine, 30 km SW of Newcastle, NSW	2,700

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Coal, black--Continued:	Rag Coal International AG, 40%, and Thiess Pty. Ltd., 40%	North Goonyella longwall coal mine, 180 km W of Mackay, QLD	3,000
Do.	BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%	Norwich Park open pit coal mine, 85 km NNE of Emerald, QLD	4,000
Do.	Oaky Creek Coal Pty. Ltd., 75%; Sumitomo Coal Australia Pty. Ltd., 15%; Itocho Coal Resources Australia Pty. Ltd., 10%, of Oaky Creek; Namoi Highwall Pty. Ltd., 50%, and Sumitomo Coal Australia Pty. Ltd., 50%, of Alliance	Oaky Creek longwall and Alliance open pit coal mines, 300 km WNW of Rockhampton, QLD	9,500
Do.	BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%	Peak Downs open pit coal mine, 145 km N of Emerald, QLD	7,500
Do.	Wesfarmers Premier Coal Ltd., 100%	Premier open pit coal mine, 10 km SE of Collie, WA	4,000
Do.	Xstrata Coal Australia Pty. Ltd., 100% of Ravensworth and 50% at Narama; Iluka Resources Ltd., 50% at Narama	Ravensworth-Narama open pit coal mine (includes Ravensworth East), at Lemington, 20 km NW of Singleton, NSW	6,200
Do.	Bloomfield Colliers Pty. Ltd., 100%	Rixs Creek open pit coal mine, 5 km NW of Singleton, NSW	2,000
Do.	BHP Mitsui Coal Pty. Ltd., 100%	South Walker Creek open pit-underground coal mine, 90 km SW of Mackay, 20 km W of Nebo, QLD	3,500
Do.	BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%	Saraji open pit coal mine, 125 km N of Emerald, QLD	5,000
Do.	Southland Coal Pty. Ltd., 90%, and Thiess Pty. Ltd., 10%	Southland longwall coal mine, 40 km W of Newcastle, NSW	2,000
Do.	G.C. Springvale Pty. Ltd., 50%, and Samsung Development (Australia) Pty. Ltd., 50%	Springvale longwall coal mine, 16 km NW of Lithgow, NSW	2,000
Do.	Austral Coal Ltd., 100%	Tahmoor longwall coal mine (includes Tahmoor North and Bargo), near Picton, about 70 km SW of Sydney, NSW	2,000
Do.	Pacific Coal Pty. Ltd., 100%	Tarong-Meandu open pit coal mine, 85 km N of Toowoomba, QLD	5,500
Do.	BHP Steel (AIS) Pty. Ltd., 100%	Tower longwall coal mine, 32 km NW of Wollongong, NSW	2,000
Do.	Ulan Coal Mines Ltd., 10%, and Mitsubishi Development Pty. Ltd., 10%	Ulan open pit-longwall coal mine, 45 km NW of Mudgee, NSW	12,000
Do.	Xstrata Coal Australia Pty. Ltd., 95%, and United Mine Workers, 5%	United Collieries underground coal mine, 15 km W of Singleton, NSW	1,600
Do.	Wambo Coal Pty. Ltd., 100%	Wambo longwall coal mine, 15 km W of Singleton, NSW	3,100
Do.	Coal and Allied Industries, Ltd., 55.574%; Mitsubishi Coal Development Pty. Ltd., 28.898%; Nippon Steel Australia Pty. Ltd., 9.528%; Mitsubishi Corp., 6%	Warkworth open pit coal mine, 11 km SW of Singleton, NSW	6,400
Do.	BHP Steel (AIS) Pty. Ltd., 100%	West Cliff longwall coal mine, 43 km NW of Wollongong, NSW	3,000
Do.	Oceanic Coal Australia Ltd., 70%; Marubeni Coal Pty. Ltd., 17%; Ocal Macquarie Pty. Ltd., 10%; Kokan Kogyo (Australia) Pty. Ltd., 3%	West Wallsend longwall coal mine, 25 km SW of Newcastle, NSW	3,000
Do.	Powercoal Pty. Ltd., 100%	Wyee longwall coal mine, 40 km S of Newcastle, NSW	1,200
Coal, brown	Alcoa World Alumina Australia, 100%	Anglesea open pit lignite mine, 97 km SW of Melbourne, near Geelong, VIC	1,200
Do.	Hazelwood Power, 100%	Hazelwood open pit lignite mine at Morwell, 150 km SE of Melbourne, VIC	19,500
Do.	Loy Yang Power Ltd., 100%	Loy Yang open pit lignite mine at Traralgon, 165 km E of Melbourne, VIC	32,000
Do.	Auspower Pty. Ltd., 73.6%; Powergen Plc., 18.4%; Deutsche Asset Management, 8%	Yallourn open pit lignite mine, 140 km SE of Melbourne, VIC	18,500
Cobalt	Preston Resources Ltd., 100%	Bulong open pit nickel-cobalt mine, 30 km E of Kalgoorlie, WA	0.1

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Cobalt--Continued:	OM Group Inc., 100%	Cawse open pit nickel-cobalt mine, 50 km NW of Kalgoorlie, WA	0.2
Do.	Anaconda Nickel Ltd., 60%, manager; Glencore Australia Pty. Ltd. International AG, 40%	Murrin Murrin open pit nickel-cobalt mine, 60 km E of Leonora, WA	0.1
Do.	Australian Nickel Mines NL, 100%	Radio Hill underground nickel-cobalt mine, 100 km ESE of Karratha, WA	0.2
Do.	QNI Pty. Ltd., 100%	Yabulu nickel-cobalt refinery, Townsville, QLD	2
Copper	Newcrest Mining Ltd., 100%	Cadia Hill open pit gold-copper mine, 21 km SSW of Orange, NSW	25
Do.	Glencore Australia Pty. Ltd., 100%	Cobar underground copper mine, 10 km NW of Cobar, NSW	30
Do.	Amalg Resources NL, 100%	Eloise underground copper mine, 60 km SE of Cloncurry, QLD	70
Do.	MIM Holdings Ltd., 51%, and Westpac Banking Corp., 49%	Ernest Henry open pit copper-gold mine, 35 km NE of Cloncurry, QLD	105
Do.	Murchison Zinc Co. Pty. Ltd., 100%	Golden Grove underground zinc-copper mine (includes Gossan Hill and Scuddles), 225 km E of Geraldton, WA	6
Do.	Thalanga Copper Mines Pty. Ltd., 70%, and BML Holdings Pty. Ltd., 30%	Highway-Reward open pit and underground copper mine, 37 km S of Charters Towers	185
Do.	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	1
Do.	Copper Refineries Pty. Ltd., operator (MIM Holdings Ltd., 100%)	MIM copper refinery, Townsville, QLD	270
Do.	MIM Holdings Ltd., 100%	MIM copper smelter, QLD	250
Do.	Matrix Metals Ltd., 100%	Mount pithbert open pit mine (includes Mount Watson), 90 km NW of Cloncurry, QLD	8
Do.	Western Metals Ltd., 100%	Mount Gordon open pit copper mine (includes Esperanza and Mammoth), 125 kilometers N of Mount Isa	46
Do.	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	275
Do.	Copper Mines of Tasmania Pty. Ltd., 100%	Mount Lyell underground copper-gold mine, 2 km NE of Queenstown, TAS	35
Do.	Straits (Nifty) Pty. Ltd., 100%	Nifty open pit copper mine, 200 km SE of Marble Bar, WA	22
Do.	Rio Tinto Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; SC Mineral Resources Pty. Ltd., 6.7%	Northparkes open pit/underground copper-gold mine, 27 km N of Parkes, NSW	55
Do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs. 80 km N of Woomera, SA	220
Do.	do.	Olympic Dam copper refinery, SA	220
Do.	do.	Olympic Dam copper smelter, SA	70
Do.	Placer Dome Asia Pacific Ltd., 100%	Osborne underground copper-gold mine, 195 km SE of Mount Isa, QLD	50
Do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	3
Do.	Furukawa Co. Ltd., 52.5%; Nittetsu Mining Co., 20%; Nissho Iwai Corp., 17.5%; Itochu Corp., 10%	Port Kembla copper refinery, NSW	120
Do.	do.	Port Kembla copper smelter, NSW	120
Do.	Newcrest Mining Ltd., 100%	Ridgeway underground gold-copper mine, 25 km S of Orange, NSW	30
Do.	Pasminco Ltd., 100%	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	1

See footnotes at end of table.

TABLE 2--Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Copper--Continued:		Selwyn Mines Ltd., 100%	Selwyn underground copper-gold mine, 150 km SE of Mount Isa, QLD	17
Diamond	thousand carats	Rio Tinto Ltd., 100%	Argyle Mine (AK-1 lamproite pipe and alluvial diamond mines), 120 km SW of Kununurra, WA	26,000
Do.	do.	do.	Merlin open pit diamond mine, 80 km S of Borroloola, NT	55
Diatomite		Australian Diatomite Mining Pty. Ltd., 100%	Barraba open pit diatomite mine, 85 km km NNW of Tamworth, NSW	25
Dolomite		OneSteel Ltd., 100%	Ardrossan metallurgical dolomite quarry, Northern York Peninsula, SA	650
Feldspar		Minerals Corp. Ltd., 100%	Triple Chance open pit feldspar mine (includes Lady Beryl, Bakers, and Spar Ridge), 42 km SW of Broken Hill, NSW	15
Garnet		GMA Garnet Pty. Ltd., 100%	Port Gregory open pit industrial garnet mine, 100 km N of Geraldton, WA	200
Gas:				
Condensate	thousand 42-gallon barrels per day	Woodside Petroleum Pty. Ltd., manager [BHP Petroleum Pty. Ltd., BP Australia Holdings Ltd., Chevron Asiatic Ltd., Japan Australia LNG (MIMI) Pty. Ltd., Shell Development (Australia) Pty. Ltd., and Woodside Petroleum Ltd., 16.67% each]	North West Shelf gas operations, 130 km offshore from Dampier, WA	60
Natural	million cubic meters per day	Woodside Petroleum Pty. Ltd., manager [BHP Petroleum Pty. Ltd., BP Australia Holdings Ltd., Chevron Asiatic Ltd., Japan Australia LNG (MIMI) Pty. Ltd., Shell Development (Australia) Pty. Ltd., and Woodside Petroleum Ltd., 16.67% each]	North West Shelf gas operations, 130 km offshore from Dampier, WA	20
Liquefied natural	million metric tons	do.	Three-train liquefaction plant, Burrup Peninsula, WA	8
Gold	kilograms	Gold Fields Ltd. (South Africa), 100%	Agnew open pit-underground gold mine, 23 km W of Leinster, WA	5,600
Do.	do.	New Hampton Goldfields Ltd., 100%	Big Bell Consolidated open pit/underground gold mine (includes Big Bell, Black Swan, Cuddingwarra, Great Fingall, Golden Crown, and Tuckabianna): Big Bell, 30 km WNW of Cue; Cuddingwarra, 10 km WNW of Cue; Golden Crown, 7 km S of Cue, WA	7,000
Do.	do.	Worsley Alumina Pty. Ltd., operator (Newmont Mining Corp., 44.45%; AngloGold Ltd., 33.33%; Newcrest Mining Ltd., 22.22%)	Boddington open pit/underground gold mine (includes Wandoo and Hedges), 150 km SE of Perth, WA[4]	12,000
Do.	do.	Normandy Yandal Operations Ltd., 100%	Bronzewing underground gold mine (includes Mount McClure), 65 km NE of Leinster, WA	9,000
Do.	do.	Newcrest Mining Ltd., 100%	Cadia Hill open pit gold-copper mine, 21 km SSW of Orange, NSW	11,000
Do.	do.	MIM Holdings Ltd., 51%, and Westpac Banking Corp., 49%	Ernest Henry open pit copper-gold mine, 35 km NE of Cloncurry, QLD	3,000
Do.	do.	Kalgoorlie Consolidated Gold Mines Pty. Ltd., 100%	Gidji Roaster gold smelter, Kalgoorlie, WA	24,250
Do.	do.	Normandy NFM Ltd., 100%	Granites-Dead Bullock Soak open pit/underground gold mine, 550 km NW of Alice Springs, in the Tanami Desert, NT	7,000
Do.	do.	Placer Dome Asia Pacific Ltd., manager (Placer Dome Inc., 60%, and Delta Gold Ltd., 40%)	Granny Smith open pit gold mine (includes Sunrise and Wallaby), 20 km S of Laverton, WA	16,000
Do.	do.	AuironGold Ltd., 100%	Henty underground gold-silver mine, 30 km N of Queenstown, TAS	3,700
Do.	do.	Thalanga Copper Mines Pty. Ltd., 70%, and BML Holdings Pty. Ltd., 30%	Highway-Reward open pit and underground copper mine, 37 km S of Charters Towers, QLD	1,000
Do.	do.	New England Antimony Mines NL, 100%	Hillgrove underground antimony-gold mine, 25 km E of Armidale, NSW	1,000

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Gold--Continued:	kilograms	Newmont Yandal Operations Ltd., 100%	Jundee-Nimary open pit/underground gold mine, 45 km NE of Wiluna, WA	12,000
Do.	do.	AuironGold Ltd., 100%	Kanowna Belle underground gold mine, 18 km NE of Kalgoorlie, WA	7,000
Do.	do.	Barrack Gold Corp., 100%	Lawlers underground gold mine, 30 km SW of Leinster, WA	3,000
Do.	do.	Sons of Gwalia Ltd., 100%	Marvel Loch Operations open pit-underground gold mines approximately 30 km SE of Southern Cross, WA	10,000
Do.	do.	Saint Barbara Mines Ltd., 100%	Meekatharra open pit mine-underground gold mine, 20 km S of Meekatharra, WA	4,000
Do.	do.	Copper Mines of Tasmania Pty. Ltd., 100%	Mount Lyell underground copper-gold mine, 2 km NE of Queenstown, TAS	1,000
Do.	do.	Harmony Gold Mining Co. Ltd., 100%	Mount Magnet open pit/underground gold mine (includes Hill 50 and Star), 2 km from Mount Magnet, WA	8,500
Do.	do.	Australian Gold Refineries, 100% (State of WA agency)	Newburn gold refinery, WA	246,000
Do.	do.	Croesus Mining NL, 100%	Norseman underground gold mine at Norseman, WA	3,700
Do.	do.	Rio Tinto Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; SC Mineral Resources Pty. Ltd., 6.7%	Northparkes open pit/underground copper-gold mine, 27 km N of Parkes, NSW	155,000
Do.	do.	Placer Dome Asia Pacific Ltd., 100%	Osborne underground copper-gold mine,	1,500
Do.	do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs, 80 km N of Woomera, SA	1,500
Do.	do.	MIM Holdings Ltd., 100%	Pacific precious metals refinery, NSW	1,900
Do.	do.	Paddington Gold Pty. Ltd., 100%	Paddington open pit gold-silver mine, 35 km NW of Kalgoorlie, WA	2,800
Do.	do.	Newmont Pajingo Pty. Ltd., 100%	Pajingo underground gold mine (includes Vera-Nancy), 60 km SSE of Charters Towers, QLD	6,400
Do.	do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	350,000
Do.	do.	Alkane Exploration Ltd., 100%	Peak Hill open pit gold mine, 50 km N of Parkes, NSW	700,000
Do.	do.	Australian Gold Refineries, 100% (State of WA agency)	Perth Refinery (Newburn), WA	95,000
Do.	do.	Homestake Mining Co., 100%	Plutonic open pit/underground gold mine, (includes Freshwater), 180 km NE of Meekatharra, WA	8,000
Do.	do.	Carpentaria Gold Pty. Ltd., 50.1%, and Haoma Mining NL, 49.9%	Ravenswood open pit mine (includes Nolans, Sarsfield, and Mount Wright), 100 km S of Townsville, QLD	3,000
Do.	do.	Newcrest Mining Ltd., 100%	Ridgeway underground gold-copper mine, 25 km S of Orange, NSW	10,800
Do.	do.	Pasminco Ltd., 100%	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	1,000
Do.	do.	Gold Fields Ltd., 100%	Saint Ives open pit/underground gold mine, 75 km SSE of Kalgoorlie, WA	15,000
Do.	do.	Selwyn Mines Ltd., 100%	Selwyn underground copper-gold mine, 150 km SE of Mount Isa, QLD	700
Do.	do.	Sons of Gwalia Ltd., 100%	Sons of Gwalia open pit/underground gold mine (includes Red October, Harlech, McGraths, Kailis, and Anchor), 5 km W of Leonora, WA	6,000
Do.	do.	MPI Gold Pty. Ltd., 50%, and Pittston Mineral Ventures of Australia Pty. Ltd., 50%	Stawell underground gold mine, 240 km W of Melbourne, VIC	3,000
Do.	do.	AngloGold Ltd., 100%	Sunrise Dam open pit mine gold (includes	8,000

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Gold--Continued:	kilograms	Kalgoorlie Consolidated Gold Mines Pty. Ltd., manager (Barrick Gold Corp., 50%, and Newmont Mining Ltd., 50%)	Super Pit open pit gold mine (includes Fimiston), SE corner of the Kalgoorlie-Boulder Township, WA	20,000
Do.	do.	Otter Gold Mines Ltd., 60%, and AngloGold Ltd., 40%	Tanami open pit gold mine (includes Central Desert Joint Venture), 650 km NW of Alice Springs, NT	2,800
Do.	do.	PacMin Mining Corp., 100%	Tarmoola open pit gold mine, 29 km NW of Leonora, WA	6,500
Do.	do.	AngloGold Ltd., 100%	Union Reefs open pit gold mine, 12 km N of Pine Creek, NT	3,000
Do.	do.	Wiluna Mines Ltd., 100%	Wiluna open pit/underground gold mine, 7 km S of Wiluna, WA	3,300
Gypsum		Gypsum Resources Australia Pty. Ltd., 100%	Lake MacDonnell open pit gypsum mine, near Point Thevenard, SA	1,400
Do.		Dampier Salt Ltd., 100%	Lake MacLeod salt and gypsum solar evaporation ponds, 65 km N of Carnarvon, WA	900
Iron ore		Hamersley Iron Pty. Ltd., 60%, and China Iron and Steel Industry & Trade Group Corp. (a Chinese Government agency), 40%	Channar open pit iron ore mine, 70 km S of Tom Price, WA	11,000
Do.		BHP Billiton Ltd., 100%	Cockatoo Island open pit iron ore mine, 130 km NNE of Derby, WA	1,050
Do.		Hamersley Iron Pty. Ltd., 100%	Hamersley Operations (includes Brockman No. 2, Marandoo, Mount Tom Price, Nammuldi, Paraburdoo, and Yandicoogina open pit iron ore mines), 30 km to 85 km NE, NW, and S of Tom Price, WA	60,000
Do.		BHP Minerals Pty. Ltd., 100%	Jimblebar open pit iron ore mine, 40 km E of Newman, WA	6,000
Do.		Portman Ltd., 100%	Koolyanobbing Central open pit iron ore mine, 50 km NNE of Southern Cross, WA	3,000
Do.		BHP Iron Ore Pty. Ltd., 85%, manager; CI Minerals Australia Pty. Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%	Mount Goldsworthy open pit iron ore mine (includes Yarrie), 180 km E of Port Hedland, WA	8,000
Do.		Imdex Ltd., 100%	Mount Gould open pit iron ore mine, 160 km W of Meekatharra, WA	6,000
Do.		BHP Iron Ore Pty. Ltd., 85%; Mitsui Itochu Iron Pty. Ltd., 10%; CI Minerals Australia Pty. Ltd., 5%	Mount Newman (includes Mount Whaleback, Orebody 23-25, Orebody 29, and Orebody 30-35) open pit iron ore mines, within 13 km of Newman, WA	25,000
Do.		Robe River Iron Associates, manager (Rio Tinto Ltd., 53%; Mitsui & Co. (Australia). Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; Sumitomo Metal Australia Pty. Ltd., 3.5%)	Pannawonica (includes Mesa J) open pit iron ore mine, 130 km SSW of Dampier WA	31,000
Do.		ABM Mining Ltd., 100%	Savage River open pit iron ore mine (includes Long Plains), 100 km SW of Burnie, TAS	2,400
Do.		OneSteel Ltd., 100%	Whyalla open pit iron ore mines, 270 km NW of Adelaide, SA	2,600
Do.		BHP Minerals Pty. Ltd., 55%; Pilbara Iron Pty. Ltd., 30%; CI Minerals Australia Pty. Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%	Yandi open pit iron ore mine, 92 km N of Newman, WA	35,000
Kaolin		Osterfield Pty. Ltd., 100%	Axedale Clays open pit kaolin mine, 18 km E of Bendigo, VIC	50
Do.		Queensland Kaolin Pty. Ltd., 96.6%, and private interests, 3.4%	Skardon River open pit kaolin mine, 85 km N of Weipa, QLD	150

See footnotes at end of table.

TABLE 2--Continued

AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Lead	Perilya Ltd., 100%	Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW	90
Do.	BHP Minerals Ltd., 100%	Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD	265
Do.	Pasminco Century Mine Ltd., 100%	Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD	70
Do.	Pasminco Ltd., 100%	Cockle Creek lead smelter, NSW	35
Do.	do.	Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW	45
Do.	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	44
Do.	do.	MIM lead smelter, QLD	160
Do.	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	150
Do.	do.	Mount Isa Smelter, QLD	240
Do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	5
Do.	Pasminco Ltd., 100%	Port Pirie lead smelter, SA	250
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	23
Magnesite	Australian Magnesium Corp. Ltd., 100%	Kunwarara open pit magnesite mine (includes Marlborough), 70 km NW of Rockhampton, QLD	3,000
Manganese	Groote Eylandt Mining Co. Pty. Ltd., 100%	Groote Eylandt open pit manganese mine at Groote Eylandt, NT	2,400
Do.	Pilbara Manganese Pty. Ltd., 100%	Woodie Woodie open pit manganese mine (includes Bells and East Pilbara leases), 400 SE of Port Hedland, WA	350
Manganese alloys	Tasmanian Electro Metallurgical Co. Pty. Ltd., 100%	Bell Bay Smelter near Launceton, TAS	260
Mineral sands	Iluka Resources Ltd., 100%	Eneabba open pit heavy-mineral sands mine, 260 km N of Perth, WA	NA
Do.	Mineral Deposits Ltd., 100%	Hawks Nest heavy-mineral sands dredge, 50 km NE of Newcastle, NSW	NA
Do.	Cable Sands (WA) Pty. Ltd., 100%	Jangardup heavy-mineral sands dredge, 50 km S of Nannup, WA	NA
Do.	Iluka Resources Ltd., 100%	North Capel open pit heavy-mineral sands mine, 7 km N of Capel, WA	NA
Do.	Stradbroke Rutile Pty. Ltd., 100%	North Stradbroke Island heavy-mineral sands dredge, 35 km E of Brisbane, QLD	NA
Do.	KMCC Western Australia Pty. Ltd., 50%, and Ticor Resources Pty. Ltd., 50%	Tiwest Joint Venture heavy-mineral sands dredge, 180 km N of Perth, WA	NA
Do.	Murray Basin Titanium Pty. Ltd., 100%	Wemen heavy-mineral sands dredge, 80 km SE of Mildura, VIC	NA
Nickel	Outokumpu Exploration Ventures Pty. Ltd., 100%	Black Swan underground nickel mine (includes Silver Swan), 53 km NE of Kalgoorlie, WA	22
Do.	Preston Resources Ltd., 100%	Bulong open pit nickel-cobalt mine, 30 km E of Kalgoorlie, WA	9
Do.	OM Group Inc., 100%	Cawse open pit nickel-cobalt mine, 50 km NW of Kalgoorlie, WA	9
Do.	Jubilee Mines NL, 100%	Cosmos open pit nickel mine, 50 km N of Leinster, WA	80
Do.	WMC Ltd., 100%	Kalgoorlie nickel smelter, Kalgoorlie, WA	100

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Nickel--Continued:		do.	Kambalda underground nickel mines, 25 km N of Kambalda to 10 km S of Widgiemooltha, WA	35
Do.		do.	Kwinana nickel refinery, Kwinana, WA	67
Do.		do.	Leinster open pit-underground nickel mines, 10 km N of Leinster, WA	44
Do.		Mincor Resources NL, 76%; Clough Mining Pty. Ltd., 12%; and Donegal Resources Pty. Ltd., 12%	Miitel underground nickel mine (includes Redross and Mariners), 70 km S of Kambalda, WA	10
Do.		WMC Ltd., 100%	Mount Keith open pit nickel mine (includes Cliffs and Yakabindie), 70 km SSE of Wiluna, WA	50
Do.		Anaconda Nickel Ltd., 60%, and Glencore International AG, 40%	Murrin Murrin nickel refinery, Murrin Murrin, WA	45
Do.		do.	Murrin Murrin open pit nickel-cobalt mine, 60 km E of Leonora, WA	100
Do.		Australian Nickel Mines NL, 100%	Radio Hill underground nickel-cobalt mine, 100 km ESE of Karratha, WA	4
Do.		QNI Pty. Ltd., 100%	Yabulu nickel-cobalt refinery, Townsville, QLD	30
Opal		Many small producers	Andamooka and Coober Pedy areas, SA; Lightning Ridge area, NSW	NA
Petroleum	thousand 42-gallon barrels per day	Exxon Mobil Corporation, 100%	Altona Refinery, VIC	120
Do.	do.	BP Amoco Refinery (Bulwer Island) Pty. Ltd., 100%	Bulwer Island Refinery, QLD	69.3
Do.	do.	Shell Refining (Australia) Pty. Ltd., 100%	Clyde Refinery, NSW	85
Do.	do.	do.	Geelong Refinery, VIC	110
Do.	do.	ChevronTexaco Corp., 100%	Kurnell Refinery, NSW	114
Do.	do.	BP Amoco Refinery (Kwinana) Pty. Ltd., 100%	Kwinana Refinery, WA	138
Do.	do.	ChevronTexaco Corp., 100%	Lytton Refinery, QLD	105.5
Do.	do.	Exxon Mobil Corporation, 100%	Port Stanvac Refinery, SA	69
Phosphate rock		WMC Fertilizers Ltd., 100%	Phosphate Hill-Duchess open pit phosphate mine, 140 km NW of Mount Isa, QLD	2,200
Salt		Dampier Salt Ltd., 100%	Dampier solar evaporation salt pans, 65 km N of Carnarvon, WA	5,000
Do.		do.	Lake MacLeod solar salt and gypsum evaporation pans, 65 km N of Carnarvon, WA	900
Do.		do.	Port Hedland solar salt fields, at Port Hedland, WA	3,000
Silica		Itochu Corp., 50%, and Tochu Corp., 50%	Kemerton silica sands dredge, 25 km NE of Bunbury, WA	450
Silver	kilograms	Perilya Ltd., 100%	Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW	81,200
Do.	do.	BHP Minerals Ltd., 100%	Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD	700,000
Do.	do.	Pasminco Century Mine Ltd., 100%	Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD	3,000
Do.	do.	Pasminco Ltd., 100%	Cockle Creek silver smelter, NSW	85,000
Do.	do.	do.	Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW	35,000
Do.	do.	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	60,000
Do.	do.	AuironGold Ltd., 100%	Henty underground gold-silver mine, 30 km N of Queenstown, TAS	1,100
Do.	do.	Thalanga Copper Mines Pty. Ltd., 70%, and BML Holdings Pty. Ltd., 30%	Highway-Reward open pit and underground copper mine, 37 km S of Charters Towers, QLD	1,000

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Silver--Continued:	kilograms	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	375,000
Do.	do.	Australian Gold Refineries, 100% (State of WA agency)	Newburn silver refinery, WA	81,000
Do.	do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs, 80 km N of Woomera, SA	12,900
Do.	do.	Paddington Gold Pty. Ltd., 100%	Paddington open pit gold-silver mine, 35 km NW of Kalgoorlie, WA	500
Do.	do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	6,000
Do.	do.	Pasminco Ltd., 100%	Port Pirie silver smelter, SA	450,000
Do.	do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	35,000
Spodumene	do.	Gwalia Consolidated Ltd., 100%	Greenbushes open pit/underground tantalite-spodumene mine, 70 km SE of Bunbury, WA	100
Steel		BHP Steel Pty. Ltd., 100%	Newcastle steelworks, NSW	1,800
Do.		do.	Port Kembla steelworks, NSW	4,000
Do.		do.	Sydney (Rooty Hill) minimill, NSW	250
Do.		do.	Whyalla steelworks, SA	1,200
Talc		Luzenac Australia Pty. Ltd., 100%	Three Springs open pit talc mine, 330 km N of Perth, WA	200
Tantalum, tantalite, Ta_2O_5	pounds	Gwalia Consolidated Ltd., 100%	Greenbushes open pit/underground tantalite-spodumene mine, 70 km SE of Bunbury, WA	600,000
Do.	do.	do.	Wodgina open pit tantalite mine, 100 km S of Port Hedland, WA	500,000
Tin (in situ)	cubic meters	Telminex NL, 100%	Ardlethan alluvial tin mine, 90 km NW of Wagga Wagga, NSW	500,000
Do.		Sons of Gwalia Ltd., 100%	Greenbushes Smelter, WA	1
Do.		Renison Bell Ltd., 100%	Renison Bell underground tin mine, 136 km S of Burnie, TAS	13
Uranium, U_3O_8	metric tons	Heathgate Resources Pty. Ltd., 100%	Beverley in situ leach uranium operation, 300 km NE of Port Augusta, SA	900
Do.	do.	WMC Olympic Dam Operations Pty. Ltd., 100%	Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs, 80 km N of Woomera, SA	1,500
Do.	do.	Energy Resources of Australia Ltd., 100%	Ranger open pit uranium mine, 230 km E of Darwin, NT	4,500
Vanadium, V_2O_5	do.	Xstrata Windimurra Pty. Ltd., 100%	Windimurra open pit mine vanadium, 100 km ESE of Mount Magnet, WA	8
Zinc		Perilya Ltd., 100%	Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW	360
Do.		BHP Minerals Ltd., 100%	Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD	100
Do.		Pasminco Century Mine Ltd., 100%	Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD	500
Do.		Pasminco Ltd., 100%	Cockle Creek zinc smelter, NSW	90
Do.		do.	Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW	125
Do.		Murchison Zinc Co. Pty. Ltd., 100%	Golden Grove underground zinc-copper mine (includes Gossan Hill and Scuddles), 225 km E of Geraldton, WA	150

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1,2,3]	Annual capacity[e]
Zinc--Continued:	Western Metals Ltd., 100%	Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS	130
Do.	MIM Holdings Ltd., 100%	Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD	175
Do.	Peak Gold Mines Pty. Ltd., 100%	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW	8
Do.	Pasminco Ltd., 100%	Port Pirie zinc smelter, SA	40
Do.	do.	Ridson zinc refinery, Hobart, TAS	230
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS	100
Do.	Sun Metals Corp. Pty. Ltd., 100%	Sun Metals zinc refinery, Stuart, QLD	170

[e] Estimated. NA Not available.

[1] Australian State and Territory abbreviations: NSW--New South Wales; NT--Northern Territory; QLD--Queensland; SA--South Australia; TAS--Tasmania; VIC--Victoria; WA--Western Australia.

[2] Bearing abbreviations: N north; NNE north-northeast; NE northeast; E east; SE southeast; SSE south-southeast; S south; SSW south-southwest; SW southwest; WSW west-southwest; W west; WNW west-northwest; NW Northwest; NNW north-northwest.

[3] Abbreviation(s) used for unit(s) of measure in this table include the following: km--kilometer.

[4] Care and maintenance; expansion project development decision pending.

TABLE 3
AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES IN 2004

Commodity[1]		Reserves
Bauxite	million metric tons	5,500
Cadmium	thousand metric tons	844
Coal:		
Black:		
In situ	billion metric tons	55
Recoverable	do.	39
Brown:		
In situ	do.	42
Recoverable	do.	38
Cobalt	thousand metric tons	1,450
Columbium (niobium) and tantalum:		
Columbium (niobium)	do.	29
Tantalum	do.	41
Copper	million metric tons	40
Diamond:		
Gem and near gem	million carats	73
Industrial	do.	75
Gold	metric tons	5,380
Iron ore	billion metric tons	12
Lead	million metric tons	19
Lithium	thousand metric tons	167
Magnesite ($MgCO_3$)	million metric tons	344
Manganese ore	do.	124
Mineral sands:		
Ilmenite	do.	209
Rutile	do.	21
Zircon	do.	32
Nickel	do.	23
Petroleum, recoverable:		
Condensate	billion liters	282
Crude	do.	227
Liquefied petroleum gas	do.	262
Natural gas	billion cubic meters	2,220
Platinum-group metals (Pd, Pt)	metric tons	23
Rare earths (REO plus Y_2O_3)	million metric tons	1
Silver	thousand metric tons	43
Tin	do.	146
Tungsten	do.	9
Uranium, recoverable	do.	675
Vanadium	do.	--
Zinc	million metric tons	35

-- Zero.

[1] Abbreviations used for commodities in this table are as follows: $MgCO_3$--magnesium carbonate; Pd--palladium; Pt--platinum: REO--rare-earth oxides; Y_2O_3--yttrium oxide.

Source: Geoscience Australia, 2004, Australia's Identified Mineral Resources 2004: Canberra, Australia, Geoscience Australia, p. 9. (Modified to no more than three significant digits.)

THE MINERAL INDUSTRY OF BANGLADESH

By Chin S. Kuo

Bangladesh's economy grew at a rate of 5.4% in terms of gross domestic product in 2004. Food grains output and remittances from overseas Bangladeshis remained steady. Inflation was still high at 6.1% in 2004. The Government planned to increase the tax base because fewer than 1 million out of a population of 140 million paid taxes. Strikes and serious infrastructure bottlenecks impeded industrial production and foreign investment. The Government was under pressure from international oil firms and donors to sell natural gas to India to raise funds for national development. Trade deficits with India continued to widen as imports continued to outpace exports. The Government allowed limited exports of natural gas to India and permitted transshipment of goods between India's hinterland and Bangladesh's northeast (Far Eastern Economic Review, 2004).

Tata Group of India was considering investing $2 billion in Bangladesh for a 1,000-megawatt (MW) gas-fired powerplant, a 2.4-million-ton-per-year (Mt/yr) steel mill, and a 1-Mt/yr fertilizer plant by yearend. The proposed powerplant would provide electricity to Bangladesh and eastern India. Production from the fertilizer plant would be used for Bangladesh's agricultural needs and for exports. Construction of these facilities could take 4 years (Reuters, 2004§[1]).

The Government wanted to ensure that Bangladesh had an adequate gas supply for its domestic needs before it committed to guarantee gas supply for a 20-year period to the Tata type project. Petrobangla estimated an additional 4.1 million cubic meters per day of gas output would become available by the first quarter of 2005. Bangladesh's gas demand was expected to reach between 39.6 million and 42.5 million cubic meters per day by 2006 compared with 2004 consumption of 35.9 million cubic meters per day. The country had proven gas reserves of 433 billion cubic meters (Platts, 2004§).

Wartsila Corp. of Finland was awarded a contract by Larfarge Surma Cement Ltd. to deliver a 30-MW powerplant for a new cement plant at Chhatak in northeastern Bangladesh. The contract for engineering, procurement, and construction was worth $16.9 million. The powerplant, which would comprise four gas engines and two diesel engines, was due for completion in the first quarter of 2005. The new cement plan would have a production capacity of 1.2 Mt/yr. The raw material would be transported from its own quarry by a 17-kilometer (km) conveyor belt (Wartsila Corp., 2004).

The Bangladesh Geological Survey discovered a coal deposit in Dianpur that was estimated to contain 50 million metric tons (Mt). The deposit comprised three seams, and further drilling was in progress to determine the extent of the deposit (Mining Journal, 2004).

Asia Energy plc., which was 25.6% owned by Deepgreen Minerals Corp. Ltd. of Australia, began a feasibility study on its 100%-owned Phulbari coal project in northwestern Bangladesh in July. The coal basin contained more than 400 Mt of resources. In situ coal resources were estimated to be 370 Mt. The company had agreements with the Government to develop and exploit the coal deposit. The project is located 30 meters (m) above sea level. Production scale called for between 9 and 15 Mt/yr of coal, which was to be sold to the local and export markets. The project could be brought into production by 2009. Asia Energy also intended to participate in the development of a coal-fired powerplant that would have the capacity to generate a total of 2,500 MW during the next 40 years (Deepgreen Minerals Corp. Ltd., 2004).

Tullow Oil plc's Lalmai-3 exploration well in Block 9 onshore Bangladesh reached its proposed total depth of 2,800 m in May. Tullow Bangladesh Ltd. (30%) was the operator with coventurers Niko Exploration Ltd. (60%) and Bangladesh Petroleum Exploration and Production Ltd. (BAPEX) (10%). The wireline logs identified potential gas-bearing sands in a number of zones between 2,200 and 2,800 m. Production test results were encouraging (Tullow Oil plc, 2004§).

Tullow Oil subsequently discovered gas in the Lalmai-3 well, which followed dry gas at rates of up to 243,000 cubic meters per day from a zone at 2,420 to 2,460 m. The discovery was close to existing pipelines, and there was a ready market in Bangladesh for any available gas. In June, Tullow Oil also was drilling the Bangora-1 well, which is located 40 km north of Lalmai-3 on the same 40-km anticlinal structure. The company had a 30% interest in the Bangora well and was the operator (Tullow Oil plc, 2004a).

The Bangora-1 well reached a depth of 3,635 m in July. Preliminary logging indicated the likely presence of gas-bearing sands in the primary target zone. Seasonal rain suspended all drilling activities. In November, Tullow Oil discovered gas in the well, which was encountered in the three gas-bearing reservoirs between 2,580 and 3,285 m. Production tests recorded an aggregate flow rate of 3.4 million cubic meters per day. Gas quality was high with 99.13% combustible gases (Tullow Oil plc, 2004b).

Niko Resources Ltd. of Canada discovered gas in the abandoned Feni Gasfield in Block 15, which is located 125 km southeast of Dhaka in eastern Bangladesh, and planned to produce between 283,000 and 425,000 cubic meters per day from the field in mid-June and reach 1.13 million cubic meters per day in the fourth quarter of 2004. Niko Resources (50%) signed an agreement with BAPEX (50%) to explore for gas in October 2003. Niko Resources invested $15 million in the project. The reserves in the field were estimated to be 28.3 billion cubic meters. The joint venture also would explore another gasfield at Chhatak in northeastern Bangladesh (Rigzone, 2004§).

The Government opposed exporting natural gas to India despite having proven reserves of 340 billion cubic meters in the country because it feared the reserves were not enough for future use. Production averaged 33.4 million cubic meters per day at below capacity in 2003 (the year for which the latest data were available). Output could be stepped up considerably if exports were allowed (Petroleum Economist, 2004).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

The Government was likely to approve the project for laying a pipeline for transmission of natural gas to India from Burma through Bangladesh. Natural gas was to be transmitted from the Akyab area in Burma through a section of the gas network in Bangladesh to India's State of West Bengal. An Indo-Korean consortium discovered gas reserves offshore Burma and planned to invest $800 million in the gas transmission project (Alexander's Gas & Oil Connections, 2004§).

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Bangladesh Petroleum Corp.
GPO Box 2003
Dhaka, Bangladesh
Telephone: 880 2 235717
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153 Pioneer Rd.
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TABLE 1

BANGLADESH: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
Cement, hydraulic[3]		3,580,000 [4]	5,005,000 [4]	5,000,000	5,000,000	5,000,000
Clays, kaolin[3]		7,900	8,000	8,100	8,200	8,300
Gas, natural, marketed[3, 5]	million cubic meters	6,500	7,000	7,200	7,300	7,100
Iron and steel, metal:[3]						
Steel, crude, ingot only		35,000	30,000	30,000	25,000	25,000
Steel products		90,000	80,000	80,000	70,000	70,000
Nitrogen, N content of urea, ammonia, ammonium sulfate		1,254,800 [4]	1,273,000 [4]	1,288,500 [4]	1,388,700 [4]	1,379,500 [4]
Petroleum:						
Crude	thousand 42-gallon barrels	1,500	1,550	1,600	1,800	1,700
Refinery products	do.	8,700	8,800	8,900	9,000	9,100
Salt, marine[3]		350,000	350,000	350,000	350,000	350,000
Stone, limestone[3]		28,000	30,000	32,000	34,000	36,000

[1] Estimated data are rounded to no more than three significant digits. Table includes data available through June 1, 2005.

[2] In addition to the commodities listed, crude construction materials, such as sand and gravel and other varieties of stone, presumably are produced, but available information is inadequate to make reliable estimates of output levels.

[3] Data are for years ending June 30 of that stated.

[4] Reported figure.

[5] Gross production is not reported; the quantity vented, flared, or reinjected is believed to be negligible.

THE MINERAL INDUSTRIES OF BHUTAN AND NEPAL

By Chin S. Kuo

BHUTAN

Bhutan is a landlocked country that lies between China and India in South Asia. In 2004, Bhutan's economy was based on agriculture and forestry, which contributed 40% and 10%, respectively, of the gross domestic product (GDP); inflation was moderate at 4.5%. The economy was closely aligned with that of India through trade—which included exports of hydroelectric power—and financial assistance. The country's key resources were its attractiveness to tourists and its hydropower potential. Construction of many hydropower projects drove the rapid GDP growth of 7% in 2004. The country's underdeveloped mineral industry was limited to the production of only a few industrial minerals (International Monetary Fund, 2005§[1]).

The Department of Geology and Mines was responsible for conducting geologic mapping, exploring mineral resources, and providing geotechnical and geoscience-related services. The Geological Survey of Bhutan carried out monitoring and mitigation of natural and geologic hazards that are prevalent in the Himalayas. The Mining Division was responsible for inspecting the mines and for drafting regulations that ensure environmentally-friendly use of economic mineral resources in Bhutan (Department of Geology and Mines, 2005§).

Bhutan's mineral reserves of dolomite, limestone, and quartzite are considered to be large. Most dolomite, gypsum, and limestone were mined for the manufacture of calcium carbide and cement. Quartzite was mined for the production of ferrosilicon and microsilica. Most industrial minerals mining was done by privately owned companies that operated in the southern part of the country. Bhutan Ferro Alloys Ltd. operated an 18,000-metric-ton-per-year (t/yr) ferrosilicon plant using Norway's Elkem technology at Pasakha, which is located 180 kilometers (km) south of Thimphu. The company was owned by Tashi Group of Bhutan (55%), the Ministry of Trade and Industry (25%), Marubeni Corp. of Japan (12%), and Japan International Development Organization (8%). Coal was mined on a small scale at Bhangstar and exported to the neighboring states of Bangladesh and India (South Asian Business, 2004§).

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Major Source of Information

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NEPAL

Nepal's GDP growth was about 3.5% in 2004. The country, which was among the poorest nations in the Asia and the Pacific region, had a per capita GDP of $1,402 based on purchasing power parity. Although earnings from tourism fell during the year, a surge in the inflow of private remittances from Nepalese nationals working overseas, which totaled $850 million in 2004, drove the country's economic growth. Investment in Nepal by Indian businesses also was on the rise. As a result, foreign exchange reserves increased enough to cover merchandise imports (Far Eastern Economic Review, 2004).

Nepal's mineral deposits are small in size and include cobalt, copper, iron, lead, limestone, magnesite, mica, and zinc. Exploration and exploitation of mineral resources were difficult owing to the country's steep mountainous terrain. In 2004, the mineral industry was dominated by the production of cement, clay, coal, limestone, magnesite, and marble. Three cement companies exploited four limestone deposits. Orient Magnesite Ltd. mined a magnesite deposit in the Dolkha District intermittently to produce 50 metric tons of dead-burned magnesia in 2004. Godavari Marble Industries Ltd. produced brown, pink, and white marbles from its deposit in the Lalitpur District (South Asian Business, 2004§).

An agreement was signed between the Government and Cairn Energy plc of the United Kingdom to explore for petroleum in five areas of Nepal. Two separate agreements were signed to explore the Tarai plains and the Chure hills. Exploration activities would be carried out in the Dhangadi region in the far west, in the Karnali region in the mid-west, in the Lumbini area of the western region, and in the Birgunj and Malangwa areas of the central region. Exploration would have to be done within 4 years; two grace periods of 2 years each could be added. Following the signing of the agreement, Cairn Energy was to submit a detailed project plan within 30 days, set up its offices in Nepal within 90 days, and start its exploration activities; the Government would receive $250,000 per year as rent (Rigzone.com, 2004§).

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TABLE 1
BHUTAN AND NEPAL: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Country and commodity[3]		2000	2001	2002	2003	2004
BHUTAN						
Cement		150,000	160,000	160,000	160,000	170,000
Coal		67,000	65,000	65,000	66,000	67,000
Dolomite		260,000	265,000	270,000	270,000	275,000
Ferrosilicon		15,000	16,000	21,000	21,000	20,000
Gypsum		54,000	55,000	55,000	56,000	56,000
Limestone		278,000	280,000	282,000	285,000	288,000
Marble	square meters	4,000	4,000	4,000	4,000	4,000
Quartzite		52,000	53,000	53,000	54,000	55,000
Slate	square meters	9,000	9,000	9,000	9,000	9,000
Talc		3,700	3,800	3,900	3,900	3,900
NEPAL						
Cement		300,000	285,000	290,000	295,000	300,000
Clay, red		2,304 [4]	2,700	2,600	32,966 [r, 4]	29,234 [4]
Coal:						
Bituminous		17,530 [4]	16,589 [4]	9,612 [4]	11,848 [r, 4]	10,459 [4]
Lignite		52 [4]	-- [4]	-- [4]	-- [4]	58 [4]
Total		17,582 [4]	16,589 [4]	9,612 [4]	11,848 [r, 4]	10,517 [4]
Gemstones:						
Quartz	kilograms	2,830 [4]	1,135 [4]	1,720 [4]	1,765 [r, 4]	1,215 [4]
Tourmaline	do.	1 [4]	-- [4]	-- [4]	-- [4]	-- [4]
Total	do.	2,831 [4]	1,135 [4]	1,720 [4]	1,765 [r, 4]	1,215 [4]
Lime, agricultural		19,360 [4]	15,587 [4]	20,000	13,025 [r, 4]	-- [4]
Magnesia, dead-burned		1,640 [4]	-- [4]	-- [4]	-- [4]	50 [4]
Salt	thousand metric tons	2 [4]	5 [4]	5 [4]	5 [4]	4 [4]
Steel, rolled		120,000	110,000	100,000	100,000	95,000
Stone:						
Limestone		352,060 [4]	287,810 [4]	356,218 [4]	269,379 [r, 4]	388,109 [4]
Marble:						
Chips		655 [4]	607 [4]	537 [4]	395 [r, 4]	481 [4]
Slab, cut	square meters	79,700 [4]	54,834 [4]	46,156 [4]	46,197 [r, 4]	56,014 [4]
Craggy	do.	1,530 [4]	1,333 [4]	2,279 [4]	681 [r, 4]	728 [4]
Quartzite		2,800	2,800	2,800	2,900	2,900
Talc		5,852 [4]	3,923 [4]	2,621 [4]	6,905 [r, 4]	3,435 [4]

[r]Revised. -- Zero.

[1] Includes data available through August 23, 2005.

[2] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[3] In addition to the commodities listed, crude construction materials, such as sand and gravel and a variety of stone, presumably are produced in Bhutan and Nepal, but information is inadequate to make reliable estimates of output levels.

[4] Reported figure.

THE MINERAL INDUSTRY OF BURMA

By Yolanda Fong-Sam

Burma is located in Southeast Asia and is bordered by the countries of Bangladesh, China, India, Laos and Thailand, the Andaman Sea, and the Bay of Bengal. This country has an area of 678,500 square kilometers (km²) and had an estimated population of 42.7 million in 2004 (U.S. Central Intelligence Agency, 2004§[1], 2005§; U.S. Department of State, 2005§).

In 2004, Burma's gross domestic product (GDP) based on purchasing power parity was estimated to be $74.1 billion, and the GDP per capita based on purchasing power parity was estimated to be $1,700. Burma's economy was based primarily on agriculture, which included fisheries, forestry, livestock, rice, and sugarcane; agriculture accounted for nearly 57% of the GDP in 2004. Other sectors that contributed to Burma's economy were industry and services, which accounted for almost 9% and 35%, respectively, of the GDP (International Monetary Fund, 2005§; U.S. Central Intelligence Agency, 2005§). The country's mineral resources include antimony, coal, copper, gemstone, lead, limestone, marble, natural gas, petroleum, precious stones, tin, tungsten, and zinc.

U.S. relations with Burma have been strained since 1988 when leaders of a military coup suppressed pro-democracy demonstrations and later established a military junta in place of the Government. In 2003, the U.S. Congress passed the Burma Freedom and Democracy Act (BFDA), which was signed into law by the President. The Act banned the import of Burmese products into the United States and the export of financial services from the United States to Burma, which impeded Burma's ability to obtain foreign exchange; the Act also extended visa restrictions on Burmese officials. In July 2004, the U.S. Congress renewed the BFDA (U.S. Department of State, 2005§).

Trade

Burma's export market totaled about $2.1 billion during 2004, which was a decrease of about 19%; imports totaled about $1.8 billion, which was a decrease of about 25%. Exports included such commodities as clothing, fish, natural gas, and rice; import goods included construction materials, transport equipment and machinery, crude oil, petroleum products, and plastics. During 2004, Burma's main export partners included Thailand (37%), India (14%), China (6.2%), Japan (5.1%), the United Kingdom (4%), and others (33.7%), and import partners included China (28.3%), Singapore (20.6%), Thailand (19.1%), the Republic of Korea (6.2%), Malaysia (4.7%), and others (21.1%) (U.S. Central Intelligence Agency, 2005§).

During the first quarter of 2004, the Confederation of Indian Industries and the Union of Myanmar Federation of Chambers of Commerce and Industries signed a memorandum of understanding (MOU) to create a task force to increase trade between Burma and India. India expected to increase the Burma-India trade volume to $1 billion by 2006, which would be an estimated 134% increase compared with 2003 trade value of $428 million between the two countries. Several infrastructural developments were required at the main trade points located at Moreh-Tamu and Zowktahthar Rhi, the northeastern border of Burma and India. Development and improvements included airports, banking and finance, power, railways, roads, and telecommunications (BurmaNet News, 2004§; Confederation of Indian Industry, 2004§).

Commodity Review

Metals

Copper.— During 2004, the copper mine production in Burma reached 31,756 metric tons (t), which was an approximate increase of 14% and 15% compared with that of 2003 and 2002, respectively (table 1).

The Monywa Copper Project, which is located in west-central Burma approximately 110 kilometers (km) west of Mandalay, 15 km west of Monywa, and 832 km north of Yangon, comprises the following deposits: Kyisintaung, Letpadaung, Sebetaung, and Sebetaung South. The first phase of the Monywa Copper Project was developed as the S&K Mine, which covered an area of 30.59 km² and encompassed the Kyisintaung, the Sebetaung, and the Sebetaung South deposits.

The Monywa Copper Project was a 50-50 joint venture of Ivanhoe Myanmar Holdings Ltd. (IMHL) (a wholly owned subsidiary of Ivanhoe Mines Ltd. of Canada) and state-owned Mining Enterprise No. 1 (ME1). In 2004, Ivanhoe's share of net income from the Monywa joint venture totaled $22.1 million; profits in 2003 totaled $2.1 million. The increase in profits was a result of higher average copper prices per pound, the increase in copper production, and improved ore grades (Ivanhoe Mines Ltd., 2005b, p. 14).

The S&K Mine, which was the only operating copper mine in Burma in 2004, expected to increase production to 38,000 t in 2005. By 2006, IMHL expected to boost annual copper production to 50,000 t by upgrading the mine's power supply to 40 megawatts; the expansion will be subject to improvements in the national power system by the Government of Burma. Ivanhoe initiated a proposal to develop the second phase of the Monywa Copper Project during a period of 4 years that will involve the Letpadaung deposit, which covers an area of 32.69 km² and is located 7 km southeast of the S&K Mine site. The development of Monywa's second phase will involve the construction of three heap-leach solvent extraction-electrowinning (SX/EW) modules, each with a capacity of 50,000 metric tons per year (t/yr) of copper cathode. Tests carried out in the Letpadaung deposit in preparation for mining yielded possible resources of 1.067 billion metric tons grading 0.39% copper. Commercial mining in the Letpadaung deposit was scheduled to start in 2007; the mine had an estimated life of 20 years. Expansions in the S&K Mine and the Lepadaung deposit will increase capacity to around 200,000 t/yr within 4 years; between 50,000 and 80,000 t/yr will be from the S&K Mine and between 125,000 and 150,000 t/yr, from the Letpadaung deposit (CRU International Limited, 2004; Ivanhoe Mines Ltd., 2005a, p. 11, 40, 48; 2005b, p. 14, 20).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

A drilling program was initiated during mid-2004 to explore a potentially significant high-grade copper deposit discovered during mining at the bottom of the Sabetaung deposit. The drilling intercepted long intervals of high-grade chalcocite mineralization; based on the mineralization dimension and grade, it was estimated to host a potential tonnage that ranged from 240,000 t grading 18.7% copper to 875,000 t grading 6.6% copper. A more-detailed drilling program was planned to confirm initial findings (Ivanhoe Mines Ltd., 2004).

Gold.—The Canadian joint-venture partners Jet Gold Corp. and Leeward Capital Corp. signed a concession agreement with the Department of Geological Survey and Mineral Exploration (GSME) to develop the 700-km² Set Ga Done gold property in Mabein Township, which is located 200 km northeast of Mandalay in northern Shan State and 90 km from the border of Yunnan Province in China. The Government of Burma approved the Set Ga Done concession agreement in December 2003 and granted it to Leeward in January 2004. The agreement made Leeward the main operator of the gold project with an ownership distribution of 75% to Leeward and 25% to the GSME. Leeward divided its 75% of the project ownership with Jet Gold on a 50-50 basis (Leeward Capital Corp, 2004a, 2005§).

The regional geology of the Set Ga Done property consists of a northeast-trending ophiolite sequence overlain by Cretaceous and Tertiary sedimentary rock units and Quaternary alluvium. The Set Ga Done zone is hosted by fractured Triassic volcanic rock units, which are overlain by a Lower Cretaceous carbonate formation (Leeward Capital Corp., 2004a, 2005§).

Exploration in early 2004 revealed the existence of a gold zone trending northeast toward a Cretaceous limestone ridge, which was interpreted as a possible feeder to a more-extensive gold mineralization located underneath the limestone ridge; it has been classified as a "Carlin-type" gold mineralization. Previous drillings in the Triassic volcanic area revealed a section that measures 4.77 meters (m) at a grade of 9.8 grams per metric ton (g/t) gold (Leeward Capital Corp., 2004b, 2005§).

The Carlin-type gold mineralization is characteristic of the gold deposits found in the United States in northern Nevada and northwestern Utah; grades in these gold deposits range from 0.6 to 29 g/t (Jet Gold Corp., 2004c).

The exploration program for the Set Ga Done property consisted of two phases. The first phase included a 1,500-m diamond drilling session and exploration across the previously delineated Nga Mu Gyi gold zone and in several other gold anomaly areas; all sites are located within the concession property. The initial phase budget of $200,000 was provided by Jet Gold. The second phase of exploration ($650,000 of expenditures) consisted of 4,000 m of drilling, which was planned to begin in early 2005. In addition to the two-phase exploration program, geologic mapping and geochemical sampling were also scheduled (Leeward Capital Corp., 2004a-c; 2005§).

The principal gold deposit in the Set Ga Done zone dips vertically and exceeds 700 m in length and 15 m in width. Preliminary results from the first-phase drilling revealed an increase in size of the Nga Mu Gyi gold zone from the initial estimate of 50 m in length to an area of 300 m by 500 m (Jet Gold Corp., 2004a). Soil sampling performed at Nga Mu Gyi indicated anomalous gold-in-soil values that range from 146 to 700 parts per billion (Jet Gold Corp., 2004c). Surface soil sampling from the northwest and south of the Set Ga Done property discovered gold concentrations that range from 4 to 40 g/t (Jet Gold Corp., 2004b). During 2005, geologic and geochemical surveys, which will include additional surface sampling and continued diamond drilling, will continue at the Set Da Gone concession.

During 2004, IMHL continued an exploration program that included trenching and diamond drilling in Block 10, which is located in central Burma. The exploration focused on a series of narrow high-grade mesothermal quartz-gold veins found in the Modi Taung Gold Project at an elevation of 1,300 m. Modi Taung is located within Block 10 approximately 150 km southeast of Mandalay and 373 km south of the Set Ga Done gold property in Nankwe District. In August 2004, Ivanhoe submitted a joint-venture proposal to the Myanmar Ministry of Mines for the development and mining of the Modi Taung region. The Ivanhoe (75%) and Ministry (25%) joint-venture proposal was under consideration by the Myanmar Investment Commission. Ivanhoe held an exploration permit for Block 10 that will expire in August 2005 (Ivanhoe Mines Ltd., 2005a, p. 62).

Nickel.—In July 2004, China Non-Ferrous Metal Mining & Construction Co. Ltd. (CNMC) and Burma's Mining Enterprise No. 3 (ME3) signed an agreement for preliminary surveys, mineral exploration, and a feasibility study for the Tagaung Taung nickel project. The project is located in northern Thabeikkyin Township, Mandalay Division, 120 km from the southeastern border town of Liangjiang in Yunnan Province (China), and a few kilometers from Ayeyarwady River (Burma), which is a potential water source for the open pit mining project. The Tagaung Taung site hosts one of the two identified nickel deposits in Burma; the other deposit is Mwe Taung, which is located near Tiddim, northern Chin State.

CNMC received approval from the Government of Burma to invest $500 million in nickel mining operations in a 40-km² section of the nickel project. Part of the investment will be for the construction of an onsite 30,000-t/yr nickel production plant. Preliminary studies revealed potential reserves of 800,000 t with an average nickel content of 2%. This project will constitute Burma's first nickel production facility (Mines and Communities, 2004§).

Zinc.—Burma's reported zinc production has been in an almost continuous decline since 2001. In 2004, production was 196 t, which was about a 54% increase compared with the 127 t produced in 2003 (table 1).

The Longh Keng Zinc Project, which consisted of a mine and a processing plant, is located in central Burma and had an estimated reserve of 175,000 t of smithsonite with an average grade of 36.9% zinc, which, if confirmed, will make it one of the highest grade zinc mines in the world. CSA Australia Pty. Ltd., which had been conducting exploration in the site, received approval from the Government of Burma to develop the zinc mine. The company planned to mine an average of 35,000 t/yr of high-grade zinc carbonate ore. CSA will build a plant to process the ore into zinc metal (CSA Australia Pty. Ltd., 2003§, 2004§).

Mineral Fuels

Natural Gas.—Burma's recoverable onshore and offshore gas reserves were estimated to be 87 trillion cubic feet (2.46 trillion cubic meters). The natural gas marketed in Burma during 2004 was 10,277 million cubic meters; this was an increase of 4.9% and 9.9% compared with the 2003 and 2002 production, respectively (table 1).

In early 2004, the Korean companies Daewoo International Corp. and Korea Gas Corp. announced the discovery of an estimated 4 trillion to 6 trillion cubic feet (113 billion to 170 billion cubic meters) of recoverable gas on Block A1, which is located in the Rakhine basin shelf in the Bay of Bengal in northwestern Burma. On the basis of the results from an exploration well within Block A1, which is called Shwe-1A zone, a production of more than 100 million cubic feet (2.8 million cubic meters) per day was expected. By the end of 2005, research on the gas reserve in Block A1 was expected to conclude, and gas production was expected to begin in 2009. Block A1 was owned by an Indo-Korean consortium that comprised Daewoo International Corp. (60%), Oil and Natural Gas Corporation (ONGC) Videsh Ltd. (OVL) (20%), and Gas Authority of India Ltd. (GAIL) and Korea Gas (10% each) (Bamber, 2004, p. 15; Petzet, 2004).

In early 2004, in addition to its participation in Block A1, Daewoo also received a 100% stake to develop natural gas in Block A3. The exploration stage was to be conducted under an agreement between Daewoo and the Myanmar Ministry of Energy. In October 2004, Daewoo signed an MOU to sell 30% of its stake in Block A3 to OVL (20%) and GAIL (10%); Daewoo held the remaining 70%. Block A3 is located on the southern edge of Block A1 in the Bay of Bengal and measures approximately 6,780 km². Two-dimensional seismic and pre-drilling surveys of Block A3 to estimate potential reserves for oil and gas will be conducted before offshore drilling starts in 2006 (Alexander's Gas & Oil Connections, 2004a§; McGraw-Hill Companies Platts, 2004§).

The Government of Burma and Daewoo were considering an investment of $3 billion in a liquefied natural gas (LNG) plant to facilitate the supply of the commodity to India and the Republic of Korea if at least 8 trillion cubic feet (227 billion cubic meters) of natural gas reserves was discovered in Block A1 (Alexander's Gas & Oil Connections, 2004b§; Schlumberger, 2004§). In the event of finding enough amounts of natural gas in Blocks A1 and A3, GAIL and OVL were also considering the possibility of an LNG plant to process the natural gas before exporting it, in its liquefied form, to India. The Government of Burma and the Indo-Korean consortium also explored other gas supply options—an onshore pipeline from Burma to India via Bangladesh, a pipeline via northeast India that bypassed Bangladesh, an offshore pipeline in international waters, or a pipeline through shallow waters off Bangladesh. In any case, Burma would be entitled to about 60% of the gas produced in Burma's blocks; the remaining percentage would be shared by the exploration partners in proportion to their equity holdings (McGraw-Hill Companies Platts, 2004§).

Burma also produced natural gas from two other reserves in the Gulf of Martaban—Yadana (an area of 26,140 km²) and Yetagun (an area of 24,130 km²). The Yadana gasfield, which began production in 1998, produced 700 million cubic feet (19.8 million cubic meters) per day, from which 650 million cubic feet (18.4 million cubic meters) per day are transported to Thailand and 50 million cubic feet (1.4 million cubic meters) per day, to onshore Burma. The reserve in this gasfield was estimated to be 5 trillion cubic feet (142 billion cubic meters). The main operator at Yadana was France-based Total E&P Myanmar (31.24%); other partners included Unocal Myanmar (28.26%), Thailand-based PTT Exploration and Production Public Company Limited (PTTEP) International Limited (25.5%), and Myanmar Oil and Gas Enterprise (MOGE) (15%). The natural gas was transported to the Burma-Thailand border via a 409-km gas pipeline (Total S.A., 2005, p. 27; Alexander's Gas & Oil Connections, 2004d§; Asean Centre for Energy, 2004§; PTT Exploration and Production Public Company Limited, 2005a§).

The Yetagun gasfield, which began production in 2000, produced 450 million cubic feet (12.7 million cubic meters) per day of gas and exported about 300 million cubic feet (8.50 million cubic meters) per day. The main operator in the Yetagun gasfield was Petronas Carigali Myanmar Inc. (40.91%); other partners included MOGE (20.45%), and PTTEP International Limited and Nippon Oil Exploration (Myanmar) Limited (19.32% each). The natural gas was transported to the Burma-Thailand border via 277 km of gas pipeline (Alexander's Gas & Oil Connections, 2004d§; Asean Centre for Energy, 2004§; PTT Exploration and Production Public Company Limited, 2005b§).

In August 2004, the Government of Burma had granted PTTEP International Limited the right to survey for gas and oil in two areas near the Yadana deposit. The agreement allowed PTTEP International Limited to survey for natural gas and petroleum reserves in M3 and M4, which have a combined area of about 18,000 km². PTTEP International Limited, which owned 100% of the shares, planned to invest $23 million in the project during the next 6 years. In addition, the company signed a production-sharing contract (PCS) with MOGE to invest in offshore petroleum exploration for Blocks M3 and M4 (Alexander's Gas & Oil Connections, 2004e§; Asean Centre for Energy, 2004§; Democratic Voice of Burma, 2004§).

Petroleum.—According to Government statistics, Burma has 19 onshore and 3 main offshore oilfields and gasfields. Reserves have been estimated to be 3.2 billion barrels of recoverable crude oil. In 2004, Burma produced 7.160 million barrels of crude oil, while the production in 2003 was 7.204 million barrels; this was a decrease of 0.6% compared with 2003, and an increase of 12% compared with 2002 production (table 1).

In September 2004, MOGE under Burma's Ministry of Energy, the Dian-Qian-Gui Petroleum Exploration Bureau of China, and China Petroleum & Chemical Corporation

(SINOPEC) agreed on an oil PSC. The agreement was a joint collaboration between the two countries to explore for gas and oil onshore Block D (an area of 12,000 km²), which is located in the Monywa District, Sagaing Division (China Internet Information Center, 2004§; Myanmar Ministry of Foreign Affairs, 2004§).

At yearend 2004, a consortium that included Chinese and Singaporean companies signed two PSCs with Burma for offshore oil and natural gas exploration. The companies involved in the contract were China National Offshore Oil Company (CNOOC), Myanmar Ltd. of China, China Huanqiu Contracting and Engineering, Golden Aaron Pte. of Singapore, and MOGE. In the contract, the companies agreed on oil and gas exploration in two areas—Block A4, which is located in western Rakhine State and covers an area of 10,000 km², and Block M10, which is located in the Gulf of Mottama (southern Tanintharyi Division) and covers an area of 15,534 km². A similar agreement, which involved the same consortium partners, to explore for oil and gas in the onshore Block M (an area of 7,760 km² that is located in the area of Kyaukpyu, Rakhine State) was signed in October 2004 (Alexander's Gas & Oil Connections, 2004c§).

Outlook

Burma's economy is expected to grow in 2005 and 2006 at a rate of 6% and 5%, respectively, on the basis of GDP at purchasing power parity. By 2006, trade between Burma and India is expected to increase by 134% following an MOU signed in 2004. Production in the mining sector will likely follow the trend in recent years and continue to be dominated by the copper, natural gas, and petroleum industries.

Exploration activity in Burma will have a tendency to continue to increase mainly as the result of the many exploration projects that started in 2004; these included two gold deposits, Modi Taung and Set Ga Done, and the developments that involve natural gas and petroleum, both onshore and offshore. Preliminary exploration that shows high-grade discoveries of nickel and zinc could also open Burma's doors to new markets within the next few years. Burma could become a leading mineral producer in Asia if ongoing explorations are proven to be feasible and profitable to develop.

Expansion and development plans in the S&K Mine and the Lepadaung deposit will increase annual copper production capacities within the next 4 years. The S&K Mine is expected to achieve production of from 50,000 to 80,000 t/yr, and Letpadaung, to reach copper production of from 125,000 to 150,000 t/yr. In addition, the discovery of a potentially significant high-grade copper zone in the Sabetaung area could increase the production of copper even more and transform the Monywa Copper Project into the leading SX-EW copper producer in Asia.

The development of interregional gas pipelines, increases in natural gas consumption in Asia and the Pacific region, and the discovery of new gasfields in Burma are circumstances that will place Burma as a key producer in the region. Also, recent gas discoveries in Burma could increase gas exports to Thailand, which is Burma's main natural gas importer.

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TABLE 1
BURMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
METALS						
Chromium, chromite, gross weight[e]		3,000	3,000	3,000	3,000	3,000
Copper:						
Mine output, Cu content		26,711	25,800	27,500	27,870	31,756
Matte, gross weight[e, 3]		125 [4]	60	100	100	150
Metal, refined		26,711	25,800	27,500	27,870	31,756
Gold, mine output, Au content[e, 3]	kilograms	250	200	200	100	100
Iron and steel:[e, 3]						
Pig iron		1,500	1,500	1,500	1,500	1,500
Direct-reduced iron		40,000	40,000	40,000	40,000	40,000
Steel, crude		25,000	25,000	25,000	25,000	25,000
Lead:						
Mine output, Pb content[e, 4]		1,200 [3]	900 [3]	900	500	500
Metal:						
Refined		1,054	1,105	425 [r, 3]	888 [r]	289
Antimonial lead (93% Pb)[e, 3]		117 [4]	--	--	--	--
Manganese, mine output, Mn content[e]		50	50	50	50	50
Nickel:[e]						
Mine output, Ni content		10	10	10	10	10
Speiss (matte), gross weight[3]		60 [4]	40	40	40	40
Silver, mine output, Ag content[4]	kilograms	2,457	1,804	778 [r, 3]	778 [r]	1,120
Tin, mine output, Sn content:[4]						
Of tin concentrate		475 [r, 3]	503 [r, 3]	302 [r, 3]	434 [r]	330
Of tin-tungsten concentrate		269 [r, 3]	156 [r, 3]	154 [r, 3]	172 [r]	196
Total		744 [r]	659 [r]	456 [r]	606 [r]	526
Metal, refined[e]		30	30	30	30	30
Tungsten, mine output, W content:[4]						
Of tungsten concentrate		1	1	1 [r, 3]	3 [r]	1
Of tin-tungsten concentrate		145 [r, 3]	85 [r, 3]	83 [r, 3]	93 [r]	106
Total		146 [r]	86 [r]	84 [r]	96 [r]	107
Zinc, mine output, Zn content[4]		437	467	138 [r, 3]	127 [r]	196
INDUSTRIAL MINERALS						
Barite		30,370	31,015	15,050 [r, 3]	4,850 [r]	2,224
Cement, hydraulic		393,355	377,961	470,858 [r, 3]	571,505 [r]	518,999
Clays:						
Bentonite[3]		978	634 [r]	600 [r, e]	600 [r, e]	500 [e]
Fire clay and fire clay powder[e, 3]		331 [4]	300	300	300	300
Feldspar[e, 3]		12,000	10,000	10,000	10,000	10,000
Gypsum		48,067	64,609	90,002 [r, 3]	66,069 [r]	71,155
Nitrogen, N content of ammonia		78,000	28,000	21,000	62,500	34,800 [e]
Precious and semiprecious stones:						
Jade	kilograms	8,318,261	8,173,936 [r, 3]	10,878,789 [r, 3]	10,692,780 [r]	12,407,576
Diamond[e]	carats	5	5	5	5	5
Rubies, sapphires, spinel[3]	do.	8,350,695	8,630,000	4,579,624 [r]	4,378,545 [r]	6,198,913
Salt[e, 5]	thousand metric tons	35	35	35	35	35
Stone:						
Dolomite		166	4,922	3,806 [r, 3]	4,572 [r]	4,184
Limestone, crushed and broken[e]	thousand metric tons	2,400	2,600	3,200	3,500 [r]	3,300
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite		52,811	41,736	115,175 [r, 3]	109,214 [r]	237,949
Gas, natural:						
Gross[e]	million cubic meters	9,400 [3]	9,700	9,400	9,400	9,400
Marketed	do.	8,477 [3]	8,804	9,353 [r, 3]	9,799 [r]	10,277

See footnotes at end of table.

TABLE 1--Continued
BURMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	3,538	4,696	6,387 [r, 3]	7,204 [r]	7,160
Refinery products[6]	do.	5,536	5,286	6,028 [r, 3]	5,835 [r]	5,133

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Table includes data available through September 21, 2005.

[2] In addition to the commodities listed, construction aggregates, sand and gravel, and silica sand are produced, but available information is inadequate to make reliable estimates of output levels.

[3] Data are for fiscal year ending March 31 of the following year.

[4] Data are for the production by the state-owned mining enterprises under the Ministry of Mines.

[5] Brine salt production, in metric tons, reported by the Government was 2000--69,245; 2001--61,466; 2002--59,825 (revised); 2003--73,112 (revised); and 2004--58,395.

[6] Includes diesel, distillate fuel oil, gasoline, jet fuel, kerosene, and residual fuel oil.

Sources: International Fertilizer Industry Association, Ammonia Statistics 2004; Ministry of Mines and Central Statistical Organization (Yangon), Statistical Yearbook 2001; Selected Monthly Economic Indicators, November 2004; World Bureau of Metal Statistics, May 2005.

TABLE 2
BURMA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Union of Myanmar Economic Holding Limited	Sinmin Cement plant	146,000
Coal		No. 3 Mining Enterprise	Kalewa Coal Mine in Sagaing Division, near Kalewa	13,000
Copper		Ivanhoe Myanmar Holdings Ltd. (50%), and Mining Enterprise No.1 (50%)	Monywa Copper Project, S&K mine, central Burma	39,000
Fertilizer, N content		Myanma Petrochemical Enterprise, 100% state-owned	No. 1 Fertilizer plant at Sales, 190 km, southwest of Mandalay	94,900
Do.		do.	No. 2 Fertilizer plant at Kyun Chaung, central Burma	75,555
Do.		do.	No. 3 Fertilizer plant at Kyaw Zwar, central Burma	219,000
Natural gas	million cubic meters	Total E&P Myanmar (31.24%), Unocal Myanmar (28.26%), PTTEP International Limited (25.5%), Myanma Oil & Gas Enterprise (MOGE)(15%)	Yadana Gasfield in Moattama, Gulf of Martaban	7,227
Do.	do.	Petronas Carigali Myanmar Inc. (40.91%), Myanma Oil & Gas Enterprise (MOGE) (20.45%), PTTEP International Limited (19.32%), and Nippon Oil Exploration (Myanmar) Limited (19.32%)	Yetagun Gasfield in Tanintharyi, Gulf of Martaban	4,635
Do.	do.	Myanmar Petroleum Resources Limited and Myanma Oil & Gas Enterprise (MOGE)	Mann Oilfield, south of Yangon	37
Petroleum, crude	thousand 42-gallon barrels	do.	do.	876
Petroleum, refined	do.	Myanma Petrochemical Enterprise, 100% state-owned	No. 1 Refinery at Thanlyin (near Yangon)	9,490
Do.	do.	do.	No. 2 Refinery at Chauk, central Burma	2,190
Do.	do.	do.	No. 3 Refinery at Thanbayakan, central Burma	9,125
Steel		Myanmar POSCO Steel Co. Ltd. (70%)	POSCO steel plant in Yangon	30,000

THE MINERAL INDUSTRIES OF CAMBODIA AND LAOS

By John C. Wu

CAMBODIA

Cambodia, which is located north of the Gulf of Thailand, south of Laos, southeast of Thailand, and southwest of Vietnam in Southeast Asia, is a small country with a total area of about 181,000 square kilometers (km^2), or about the size of Missouri. In 2004, it had a population of about 13.4 million. The country was one of the poorest and least developed in the Asia and the Pacific region. Its per capita gross domestic product (GDP) and GDP, based on purchasing power parity, were estimated to be $2,074 and $29.2 billion, respectively, in 2004 (U.S. Central Intelligence Agency, 2005§[1]; International Monetary Fund, 2005§).

The country's mineral resources were largely unexplored and unexploited. The identified mineral resources were ruby, sapphire, and zircon in the northwestern Province of Batdambang and manganese, phosphate, and salt in the central part of the country (Royal Government of Cambodia, 2004§). In addition to natural gas and petroleum, Cambodia has geologic environments that have the potential to host resources of bauxite, copper, gold, granite, kaolin, limestone, pagodite, peat, sand and gravel, silica sand, slate, tin, and zinc (World Investment News, 2004§).

To attract domestic and foreign mining companies to invest in mineral exploration and development, the Law of Minerals Management and Mining of Cambodia was promulgated by the Government on July 13, 2001 (United Nations, 2002§). The Ministry of Industry, Mines, and Energy (MIME) is the main Government agency that implements the law and the country's mineral policy. The Department of Geology and Mines and the Department of Energy under the MIME are responsible for developing the country's mineral resources, providing mining assistance to the private sector, and administering mining-related regulations and inspections (Asian Journal of Mining, 2000).

Under the country's mineral exploration policy, interested investors and companies are granted an exploration license by the Cambodia Development Council (CDC) for a period of 2 to 6 years to explore and then prepare a feasibility study in a designed area, and the MIME provides assistance with technical recommendations. Following a successful exploration, investors and companies are required to submit a master project plan for mine development. If successful, then the CDC grants a mining license to investors or companies. Royalties and surface rentals are levied on mined minerals. In addition to royalties and surface rentals, investors or companies are required to pay income tax when the mining operations become profitable. The MIME offers investors or companies production-sharing contracts with low tax rates or concessions with high tax rates (World Investment News, 2004§).

The mining sector, which was still in its infancy, was the smallest sector of the Cambodian economy and contributed only a small fraction (about 0.3%) of the country's GDP. According to Labor Force Survey of Cambodia estimates, the total workforce in the mining and quarrying sector was about 11,000 compared with Cambodia's total workforce of 6.3 million (International Monetary Fund, 2004). In 2004, Cambodia's GDP grew by 4.3% compared with 5.2% in 2003. The country's GDP, in current prices, was estimated to be $4.4 billion compared with $4.2 billion in 2003 (International Monetary Fund, 2005§).

According to the Cambodian Department of Mineral Resources Development, the mining activities in Cambodia during the past 2 years involved production of construction aggregates, laterite blocks (red soil), phosphate rock, salt, sand and gravel, and stone. Crushed stone and sandstone were produced mainly in the Kampong Speu area and in several locations between Phom Penh and Takeo. Phosphate rock was mined and processed in the Tul Meas area in the Province of Kampot or processed at a small plant in the Province of Batdambang. Salt was produced from evaporating seawater in the coastal area of the Gulf of Thailand.

In 2004, the International Investment Development Group of Cambodia signed an agreement with Henan Jinqu Gold Company of China to establish the JINQUMINERALS Co. Ltd. to prospect, mine, and smelt gold and silver in the Province of Mondol Kiri. The Chinese company was to take a 90% interest in the joint venture by investing about $17 million in the project, and the International Investment Development Group of Cambodia was to take the remaining 10% interest (Infomine-china.com, 2004§).

According to the Hong Kong-based Corporate Social Responsibility in Asia (CSR Asia), a report disclosed in September 2004 that the increased use of highly toxic chemicals in gold mining had caused serious environmental damage and health hazards in the Cambodian countryside. The official records, however, showed no gold production in Cambodia for the past several years. According to the report, most of the 19 known gold deposits in Cambodia used toxic mercury and cyanide techniques to extract gold. Between 5,000 and 6,000 people, most of whom were unskilled migrant workers, worked as gold miners during the peak mining season from November to May and were, consequently, exposed to serious health risks because of a lack of protective gear and poor training in storing, using, and disposing mercury and cyanide. A case of cyanide poisoning in a river in northeastern Cambodia caused by mining operations early in 2004 reportedly had caused many deaths of fish and cattle. Some villagers felt sick after drinking the contaminated ground water. Other environmental damages included deforestation and the disappearance of wildlife (CSR-Asian.com, 2004§).

Cambodia reported no proven reserves of natural gas and petroleum. Cambodia and Thailand had overlapping claims in a 27,000-km^2 area of the Gulf of Thailand thought to be rich in hydrocarbons. According to an estimate that was based on 12,000 line-kilometers of high-quality seismic data, the overlapping claims area was believed to contain about 311 billion cubic meters of natural gas reserves and an undetermined amount of natural gas liquids and petroleum.

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[1] References that include a section mark (§) are found in the Internet References Cited sections.

In 2002, the Cambodia National Petroleum Authority awarded block A, which covers a 6,278-km^2 area in the overlapping claims area, to a consortium led by ChevronTexaco Corp. of the United States. In 2004, LG-Caltex Oil Corp. acquired a 15% interest in exploration block A from ChevronTexaco and paid about $18 million. A preliminary study estimated that the block could contain about 400 million barrels of crude petroleum and about 85 billion cubic meters of natural gas. During 2003, ChevronTexaco, which was the operator of block A, drilled one exploration well with subcommercial results. New three-dimensional seismic data were acquired and processed over a portion of the block; as a result, four additional exploration wells were drilled by ChevronTexaco in 2004. In late 2004, Cambodia's National Assembly President disclosed to local reporters that ChevronTexaco had struck a commercially viable oilfield and would start production by 2007. According to ChevronTexaco, however, the company needed to complete the drilling program and to assess the well results fully before it could determine the commercial potential of the oil finds in the Gulf of Thailand (ABC Radio Australia, 2005§; Agency Kampuchea Press, 2004§)

Outlook

The mining sector is expected to remain the smallest sector of the Cambodian economy during the next 5 years unless economically viable reserves of oil and natural gas in block A are discovered and developed by the consortium led by ChevronTexaco by 2007. Cambodia's economy as measured by GDP has been forecasted to grow by 1.9% in 2005 and 4.3% in 2006 (International Monetary Fund, 2005§).

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LAOS

Laos, which is located north of Cambodia, southeast of Burma, south of China, northeast of Thailand, and west of Vietnam in Southeast Asia, is a small landlocked country with a total area of about 237,000 km^2. In 2004, it had a population of about 6.1 million. Laos was one of the poorest and least developed countries in the Asia and the Pacific region. In 2004, the per capita gross domestic product (GDP) and GDP, based on purchasing power parity, were estimated to be $1,921 and $11.1 billion, respectively (U.S. Central Intelligence Agency, 2005§; International Monetary Fund, 2005§).

The identified mineral resources in Laos were barite, clays, coal, copper, dolomite, gold, graphite, gypsum, limestone, rock salt, sapphire, silver, tin, and zinc. Laos has geologic environments that have the potential to host such other resources as antimony, asbestos, bismuth, cobalt, iron ore, kaolin, lead, lignite, manganese, molybdenum, potash, silica sand, and tungsten. There are geologic environments that are favorable for the occurrence of coal, copper, gold, iron ore, potash, rock salt, and tin (Asian Journal of Mining, 2000).

The mining sector, which was dominated by the mining of gold, gypsum, limestone, and tin, was the smallest sector of the Laotian economy. The mining sector was estimated to contribute 0.3% to the country's GDP. In 2004, Laos' real GDP growth was estimated to be 6% compared with 5.3% in 2003 (International Monetary Fund, 2005§). According to the Department of Geology & Mines, production of mineral commodities in 2002 and 2003 included barite, carbonate rocks (construction aggregate and limestone), clay, coal, gemstones (ruby and sapphire), gold, gypsum, rock salt, sand and gravel, silver, tin, and zinc (table 1). Most mining activities in Laos were small scale and owned and operated by State-owned mining enterprises or by joint ventures of State-owned companies and foreign companies.

To promote and encourage foreign investment in the mining sector, a mining law was promulgated by the Government on April 12, 1997, and fiscal incentives (tax holidays) for minerals exploration were also provided. By October 1998, 21 licenses had been issued to foreign companies—8 were for construction materials (clay, granite, gypsum, limestone, and sandstone) exploration; 5, gold; 3, coal; 2, tin; and 1 each, oil and gas, sapphire, and zinc (Asian Journal of Mining, 1999).

By 2004, Oxiana Ltd. of Australia had invested about $330 million and Pan Australian Resources, N.L. (PARNL) of Australia was expected to invest up to $165 million for exploration and development of copper and gold projects in Laos. Padaeng Industry Public Co. Ltd. of Thailand had been investing in the exploration and development of a zinc project in Laos during the past 4 years. These three companies were expected to continue to invest in exploration and development of copper, gold, silver, and zinc resources in Laos (Far Eastern Economic Review, 2004).

In 2004, the Sepon gold mine, which was owned and operated by Lane Xang Minerals Ltd. (100% owned by Oxiana through its wholly owned subsidiary Oxiana Resources Laos Ltd.), produced 2.5 million metric tons (Mt) of ore at a grade of 3.01 grams per metric ton (g/t) gold compared with 1.57 Mt at a grade of 4.42 g/t gold in 2003. The mill (treatment plant) processed 1.38 Mt of ore at grades of 3.73 g/t gold and 6.33 g/t silver compared with 1.17 Mt of ore at grades of 5 g/t gold and 8.41 g/t silver in 2003. Recovery rates for gold and silver were 85.4% and 31.3%, respectively, compared with 87.7% and 39.0%, respectively, in 2003. In 2004, mine production of gold and silver from the Sepon gold mine was 4,392 kilograms (kg) (141,213 troy ounces) and 2,735 kg (87,920 troy ounces), respectively, compared with 5,140 kg (165,255 troy ounces) and 3,850 kg (123,782 troy ounces), respectively, in 2003. The total cash operating cost rose to $6,076 per kilogram ($189 per troy ounce) from $4,340 per kilogram ($135 per troy ounce) in 2003 owing mainly to increased royalties and operating costs. As a result, the total production costs (cash operating cost plus depreciation, depletion, amortization, and rehabilitation) rose to $8,295 per kilogram ($258 per troy ounce) from $6,848 per kilogram ($213 per troy ounce) in 2003 (Oxiana Ltd., 2004a§).

In 2004, the designed capacity of the Sepon gold-processing plant was expanded to 2.5 million metric tons per year (Mt/yr) from 1.25 Mt/yr. Design and construction of the expansion project was completed on schedule in 10 months with a budget of $32 million. The expansion project included a new larger capacity crusher and ball mill and four new larger carbon-in-leach tanks. By the end of 2004, Oxiana also completed the Sepon copper-processing plant. Mining of the Khanong copper ore body began in late 2004, and about 45,800 metric tons (t) of ore was mined and stockpiled by the end of 2004. The mine, which was officially scheduled to start in February 2005, will have a capacity to produce 1.3 Mt/yr of ore that would be processed by a plant that will use a whole of ore leach; the resulting liquid will be processed by solvent-extraction electrowinning. The copper-processing plant was designed to produce 60,000 metric tons per year (t/yr) of copper cathodes. The $235 million Khanong copper project was scheduled to start production of copper cathode by the end of March 2005. Ramp up to full production rates of 60,000 t will continue throughout the year with an initial planned production of 30,000 t anticipated in 2005 (Oxiana Ltd., 2004b§).

In December 2004, PARNL announced that it awarded the Lead Consultant's contract to Ausenco Ltd. for the Phu Kham copper-gold feasibility study in the southeastern part of the 2,600-km^2 Phu Bia contract area, which was located about 100 km northeast of Loas' national capital Vientiane. The bankable feasibility study contract included metallurgical and infrastructure studies by Ausenco, a mineral resources estimation by Hellman & Schofield Pty Ltd, an open pit mine design and ore reserve estimation by Australian Mine Design and Development Pty Ltd., drilling and blasting studies by Tim Hagan Blasting Pty Ltd., geotechnical and hydrological studies by Knight Piésold Pty Ltd., and an environmental impact assessment by Earth System Lao. The feasibility study, which was scheduled for completion in August 2005, was expected to confirm the potential for the Phu Kham copper-gold deposit to support an economically viable mining and processing operation at processing rates of 9 Mt/yr with a capital cost of $138.6 million and 12.5 Mt/yr with a capital cost of $163.8 million; annual copper-gold production could range from 57,600 to 100,000 t of copper and from 1,617 kg (52,000 troy ounces) to 2,239 kg (72,000 troy ounces) of gold in concentrate (Pan Australian Resources, N.L., 2004c§).

According to the preliminary study completed by PARNL in March 2003, which focused in the metallurgical and processing characteristics of the Phu Kham copper-gold deposit, the estimated cash operating cost range between $0.47 per pound copper and $0.54 per pound copper with a capital cost range between $138.6 million for the 9-Mt/yr scenario and $163.8 million for the 12.5-Mt/yr scenario and a recovery rate of 80% copper for a 25% grade in concentrate and a recovery rate of 60% gold for a 9-g/t grade in concentrate. Mine life was estimated to be 10 years. The Phu Kham copper-gold deposit is part of a copper-gold porphyry system. Overlying the sulfide copper-gold deposit is an oxide gold cap, which will be mined as part of the Phu Bia gold project. The gold cap would be removed as part of the prestrip for the Phu Kham copper-gold project, which was estimated to contain 213 Mt of inferred mineral resources at grades of 0.6% copper and 0.3 g/t gold that contains 1.27 Mt of copper and nearly 62,200 kg (2 million troy ounces) of gold at a 0.3% copper cut-off grade or 108 Mt at grades of 0.8% copper and 0.3 g/t gold that contains 907,200 t of copper and 31,100 kg (1 million troy ounces) of gold (Pan Australian Resources, N.L., 2004a§).

In July 2004, the feasibility study for the Phu Bia gold project was completed for PARNL by Metallurgical Design & Management Pty Ltd. The study confirmed that the project could support a technically and economically robust oxide heap-leach gold mine based on proved and probable oxide ore reserves of 7.5 Mt at 1.1 g/t for 8,100 kg (262,000 troy ounces) of contained gold. In November 2004, as a result of resources drilling and pit optimization studies, PARNL revised its estimated proved and probable oxide ore reserves at the Phu Bia gold project, which included the Phu Kham Gold Cap, the Ban Houayxai, and the Long Chieng Track deposits, to 8.6 Mt at 1.1 g/t for about 9,300 kg (300,000 troy ounces) of contained gold.

The Phu Bia gold project was scheduled to start gold production in March 2005 (Pan Australian Resources, N.L. 2004b§, c§).

First Pacific Mining Company reportedly signed a contract with the Planning and Cooperation Committee in 2003 to build a plant and start mining in a 20-km^2 area of Pha Luan in Vang Vien, Vientiane Province, following completion of the survey work in a 56-km^2 area, which started in early 2002. The contract allowed First Pacific Mining to mine barite, lead, and zinc for 18 years. The company reportedly had invested $2 million for the survey work and mine development. The project would create about 200 jobs, upgrade roads, and supply electricity in the area's villages (Embassy of Laos in Washington, D.C., 2003§).

Vietnam Economic Cooperation Company reportedly obtained a permit from the Laotian Government in February 2004 to explore and survey gypsum deposits in Nadon Hamlet, Thakhec Town, Kammuon Province. The project involved an 18-month exploration and survey in a 1,550-hectare area with startup capital of $1 million; during the past 6 months, a report on technical and economic facts would be prepared (VietnamTrade.org, 2004§).

Outlook

In the next 4 years, the mining sector is expected to expand considerably. Oxiana is expected to increase its gold production capacity and to begin copper production at its Khanong copper mine by 2005. Production capacities of copper and gold could be increased further following the development of the Phu Kham copper-gold project and the Phu Bia gold project by PARNL in the next 2 years. The Laotian economy is expected to grow by 7% in 2005 and 6.5% in 2006 (International Monetary Fund, 2005§).

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TABLE 1
CAMBODIA AND LAOS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2000	2001	2002	2003	2004[e]
CAMBODIA[2]						
Cement, clinker[e]		--	--	--	--	--
Gravel		12,800 [e]	1,880	9,800 [r]	13,800 [r]	10,000
Laterite, blocks		29,700	42,800	381,400 [r]	228,900 [r]	230,000
Phosphate fertilizer		3,617	900	115 [r]	-- [r]	--
Quartz sand		17,017	5,050	--	1,000	--
Sand, construction materials		690,000 [e]	563,860	505,960 [r]	207,800 [r]	500,000
Stone, crude construction material		248,100	280,740	567,500 [r]	713,600 [r]	600,000
Salt		40,000 [e]	11,000	72,500	36,000 [r]	40,000
LAOS[3]						
Barite		2,000	4,400	12,695 [r]	18,070 [r]	18,000
Coal, bituminous		126,290	122,942	233,923 [r]	212,819 [r]	220,000
Cement[e]		92,000	92,000	240,000	250,000	250,000
Gemstones	carats	189,284	--	833,984 [r]	2,302,973 [r]	800,000
Gold	kilograms	--	--	--	5,368 [r]	4,400
Gypsum		131,517	121,220	110,272	101,727 [r]	102,000
Limestone		221,600	287,900	1,315,140 [r]	379,000 [r]	400,000
Salt, rock		1,779	2,635	5,410	16,130 [r]	15,000
Silver	kilograms	--	--	--	3,850	2,740
Tin, mine output, Sn content		408	490	366	360	340
Zinc, mine output, Zn content[e]		60	9,310 [r]	370 [r]	850 [r]	300

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. -- Zero.

[1] Table includes data available through May 27, 2005.

[2] In addition to the commodities listed, clay, gemstones, gold, iron ore, and lime are presumably produced, but available information is inadequate to make reliable estimates of output levels.

[3] In addition to the commodities listed, crude construction materials, such as sand and gravel, and varieties of stone were produced irregularly.

Sources: Asian Journal of Mining, Asian Mining Yearbook (11th ed.), 2000, p. 13; Cambodia's Ministry of Industry, Mines and Energy; Laos' Ministry of Industry and Handicraft; U.S. Geological Survey Minerals Questionnaires for Cambodia and Laos, 2002-03; Oxiana Ltd. Annual Report 2004.

THE MINERAL INDUSTRY OF CHINA

By Pui-Kwan Tse

Even though the Government took steps to "cool down" the strong growing sectors, such as aluminum, automobiles, cement, real estate, and steel, that the Government considered to be "overheated," China's economy continued to expand at a rapid pace. The gross domestic product (GDP) increased by 9.5% to $1.65 trillion, and the per capita GDP rose to $1,270 in 2004. The growth rate of the industrial sector fell to 11.1% in 2004 from 12.7% in 2003. Investment spending was the main engine of economic growth. Fixed asset investment grew by 25.8% to $844 billion, of which about 4% was in the mining sector. Investment of manufacturing grew faster than that in agriculture and services. The rate of investment in manufacturing increased by 38.3%, and that of agriculture rose by 20.3%, which was a turnaround from negative growth in 2003. In 2004, the state-owned and state-controlled enterprises accounted for 48.1% of the total fixed asset investment. In 2004, the fixed investment rate in the cement and steel sectors increased by 43.3% and 32.3%, respectively, compared with 70.1% and 63.9%, respectively, in 2003 (State Development and Reform Commission, 2005; State Statistics Bureau, 2005).

In spite of strong growth, the inflation rate remained manageable at 3.9% in 2004. During the past several years, private consumption expanded at a slower rate than Government consumption and fixed asset investment. The growth of industry and consumption in rural areas was slower than in urban areas. China continued to receive significant foreign investment compared with other countries in Asia and the Pacific region. Actual foreign direct investment (FDI) rose to $60.6 billion in 2004 from $53.5 billion in 2003, and short-term foreign capital was about $120 billion in 2004. The 276 Sino-foreign investment projects in the mining sector had a total value of $1.16 billion; actual FDI, however, was $540 million. Since China became a member of the World Trade Organization (WTO), its infrastructure has continued to strengthen, and its business environment has improved significantly. Multinational enterprises have accelerated their relocation of labor-intensive and export-oriented industries to China (Asian Development Bank, 2005, p. 1-200; State Statistics Bureau, 2005).

Government Policies and Programs

China's economic reforms have resulted in extraordinary growth in the past 2 decades. The GDP increased by an average of more than 8% in the past decade. The Government outlined its priorities in the next 5-year plan, which included increasing rural incomes, creating jobs, developing the private sector, strengthening the rule of law, developing more mechanisms for citizen participation, and financial and state-owned enterprise (SOE) reforms. The long-term goal of the Government was to raise per capita GDP to $3,000 by 2020, which would require an annual economic growth rate of more than 7%. The Government predicted that the economic growth rate would be 8% in the next 2 years (International Monetary Fund, 2005, p. 3-50; Citigroup Global Market Inc., 2005b, p. 1-10).

The Chinese Government continued its macroeconomic control policy to tighten credit and land supply until investment growth slowed to a more sustainable and manageable level. Public spending will be shifted from supporting investment to stimulating consumption. The Government planned to eliminate agriculture taxes in 26 of its 31 Provinces within 5 years so that 700 million farmer incomes would increase by 2%. This should help a steady consumption growth as investment grows. The Government also planned to improve the financial institution framework so that the foreign exchange markets can reflect the supply and demand for foreign currencies before the Government considers changing the exchange rate regime. Making the renminbi fully convertible and introducing greater flexibility to the exchange rate regime ares the ultimate policy goals of Chinese monetary policy; China, however, will need to build sound financial institutions. It could be a multiyear task (Citigroup Global Market Inc., 2004b, p. 3-15; 2005a, p. 4-16). The Government issued detailed regulations on issuing of renminbi bonds by multilateral development organizations. The World Bank and similar agencies that have investments or loans of more than $1 billion will be allowed to raise funds in the domestic debt market to finance projects in China (Hong Kong and Shanghai Banking Corp. Ltd., 2005b).

The Government took a number of policy measures to avert potential economic overheating. The People's Bank of China (Central Bank) introduced tighter regulations on real estate lending in June 2003, but they were not effectively implemented because of resistance from local governments and interest groups. The Government believed that it would be more successful in cooling investment in such sectors as cement and steel if it reduced demand in end markets. At yearend 2004, the Central Government raised the downpayment ratio for home purchases to 30% from 20% and increased the interest rate of 5-year housing loans to 6.12% from 5.31%. The Government also replaced management officials in state-owned banks and convinced local governments to support the tightening measures. If these measures are not enforced, then excess capacity could be exacerbated in a number of sectors, and the bad debt problems that the bank system has been experiences could be increased. The Central Bank issued guidelines to prohibit or discourage investment and lending in more than 500 sectors and to tighten monetary policy through higher bank reserve requirements, open market operations, and increased interest rate (Gazette of the State Council of the People's Republic of China, 2004).

The Government allowed domestic companies that were engaged in foreign trade to retain their foreign exchange earnings quotas for 90 days instead of 10 days. Companies that had large foreign trading volumes (not defined) will be allowed to retain 100% of their foreign exchange earnings instead of 50%.

This change could be seen as a step in the easing of China's foreign exchange control, which may be the way for a complete abolishment of the export-earnings surrender system (Hong Kong and Shanghai Banking Corp. Ltd., 2005a).

The coastal region remained the main engine of economic growth and accounted for 50% of fixed asset investment and more than 60% of industrial production. Because many of the economic activities were concentrated in the narrow coastal belt, more signs of overheating and overinvestment were present there. Most cites in the coastal area experienced shortages of electricity and labor. During the past several years, the Government invested heavily in infrastructure development in the central and western parts of the country. As a result, infrastructure facilities have improved significantly in the west. That major natural resources, such as bauxite, coal, copper, natural gas, lead, oil, tin, and zinc, are located in the central and western regions could reduce transaction costs for shipping raw materials to the coastal area. Production costs were lower in the west than those in the coastal area. The Government also provided investment incentive for developing the western region. Many western Provinces can also benefit from cross-border investment and trade activities with Central, South, and Southeast Asia (Citigroup Global Market Inc., 2004a, p. 16-25).

The Government set banking reform as one of its top priorities. One of the conditions of full WTO membership was to allow foreign financial institutions to participate fully in the financial system by 2006. In 2003, the Government launched a new banking reform program that shifted the regulatory focus to capital adequacy and prioritized ownership restructuring of large state-owned banks. The Government planned to allow one of the four major state-owned banks to be listed in the stock exchange in 2005. Nine foreign banks had taken stakes in domestic banks, and another nine banks were in the process of negotiations. On December 1, China allowed foreign banks to conduct renminbi business in Beijing, Kunming, Shenyang, Xiamen, and Xian; this made a total of 18 cities. The State Administration of Foreign Exchange issued a circular that limited short-term offshore borrowings by branches of domestic and foreign banks. The limits were set at $34.8 billion for foreign banks and $24.5 billion for domestic banks (Citigroup Global Market Inc., 2004c, p. 6-10).

China's rapid economic growth posed a major challenge for the management of its natural environment. Land degradation, deficiency in quality and distribution of the available water, high levels of air pollutants, and declining natural forests and mineral resources threatened the sustainability of long-term growth. China had shortages in most minerals, such as bauxite for producing alumina, chromium, copper, iron, manganese, nickel, and oil and relied on imports to meet the demand. Since the late 1990s, the Government has encouraged and provided information to companies on the exploitation of minerals in other countries. In 2004, the Government issued guidelines on how to apply state-supported funds to mineral developmeny projects in other countries (Ministry of Commerce, 2004e; PricewaterhouseCoopers International Ltd., 2004a).

After 10 years of consultation, a draft Enterprise Bankruptcy Law was submitted to the National People's Congress Standing Committee for its consideration and approval at yearend 2004. China did not have a unified bankruptcy law that covered all types of enterprises. Laws that govern enterprises include Civil Procedure Law, Company Law, Measures on Liquidation Procedures for Foreign Investment Enterprises, and the Law of the People's Republic of China on Enterprise Bankruptcy (for trial implementation). Since the Government allowed enterprises to declare bankruptcy in the late 1990s, an estimated 70,000 enterprises have gone bankrupt in China. The proposed legislation will help China transform into a more-transparent market economic country. The drafted Enterprise Bankruptcy Law will cover all types of debtor entities, such as private and state-owned enterprises. The draft law, if implemented, will allow distressed enterprises with no prospect of rehabilitation to terminate their operations and those with future prospects to start fresh through restructuring and conciliation. The draft law will provide foreign investors with a defined mechanism for direct investments in many insolvable enterprises in China (PricewaterhouseCoopers International Ltd., 2004b).

The Government has set up a task team from various Government agencies to draft a unified enterprises' income tax rate for domestic and foreign companies. The unified enterprises' tax rate will range between 24% and 26%. There will be a transitional period for foreign companies and a preferential period of 2 to 3 years for newly established foreign companies in China. These changes will provide fairness for domestic and foreign companies and will create a better investment environment for foreign investors (U.S. Embassy, Beijing, China, 2005b).

On December 29, the National People's Congress Standing Committee amended the Law on Solid Waste Pollution Prevention and Control, which was to become effective on April 1, 2005. The law clarified that manufacturers, importers, sellers, and consumers were all responsible for the prevention and control of solid waste pollution of the environment. The Government could force the manufacturers to recycle some categories of products and packaging. The State Council will issue the recycling list and methods for recycling these products. The Central and local governments will publish solid waste information on a regular basis, and polluters will be fined (U.S. Embassy, Beijing, China, 2005a).

Production

Before 1998, regional statistical offices provided commodities production data to the National Statistical Bureau (NSB). In 1998, the NSB changed its statistical survey method to improve data reliability and requested companies that had sales revenues of more than $605,000 to report their output. Many small producers were not included in the survey. Therefore, the actual output of mineral commodities, such as antimony, bauxite, copper, iron, lead, molybdenum, tin, tungsten, and zinc, was expected to be higher than the NBS-released data. In 2003, the NBS tried to include minor producers in its survey. As a result, outputs of iron and lead were much higher than in previous years (China Metals, 2005e).

During the past several years, China had fueled an expansion capacity to the extent that some formerly imported products, such as aluminum, were exported. The growth of pig iron, crude steel, and steel products have expanded by an annual rate of 20% or more. Initially, the growth was generated by strong domestic demand. Recently, however, China has moved from being a net importer to a net exporter of some steel products. Because of China's shortage of raw materials, such as alumina and ores of chromium, copper, iron, manganese, and nickel, imports of these raw materials have been growing sharply (Menzie and others, 2004§[1]). China searched for mineral resources in other countries to support its demand. Countries rich in mineral resources, such as Australia, Brazil, and Chile, have benefited from the strong demand for raw materials from China. Countries that produced high-technology products, such as Japan and the Republic of Korea, also benefited from China's investment-led growth.

In 2004, aluminum metal output continued to increase sharply. During the past 2 years, about 28 smelters that used Soderberg cells with a total output capacity of about 300,000 metric tons (t) were shut down. These smelters were forced to close because of shortage of alumina or electricity or both. Under the Government trade policy, only Aluminum Corporation of China Co. Ltd. (Chalco), China Minmetals Nonferrous Metals Co. (Minmetals), and several large smelters were allowed to import alumina directly. Others have to purchase it from Chalco or Minmetals. Owing to environmental issues, Chalco and Minmetals preferred to supply alumina to larger and pre-baked cell smelters. Larger aluminum smelters, however, expanded their output capacity in response to high demand in the international markets. Smelters, such as Danjiang, East Hope Baotou, Henan Zongfu, Hunan Chuangyuan, Nanshan, Shandong Xinfa, Qingtongxia Jianing, Yunnan, and Yanzhou Ke'ao, either expanded their output capacities or were being built. About 1.3 million metric tons per year (Mt/yr) of newly installed output capacity was added in 2004, and aluminum metal output capacity expanded to more than 8.8 Mt/yr at yearend 2004. According to the companies' expansion and greenfield plans submitted to the Government for approval, China will have an aluminum production capacity of about 10 Mt/yr in 2005. With the rapid increase of aluminum production, the ability of domestic alumina producers to meet demand will be much more difficult. In 2004, China imported about 5.9 million metric tons (Mt) of alumina, which accounted for about 45% of the total demand. The strong demand for alumina by aluminum smelters affected domestic and international market prices of alumina. With the shortage of electricity and the high price of alumina, many domestic aluminum smelters operated at a financial loss in 2004. To reduce production costs, aluminum smelters formed alliances with coal-power companies to ensure receipt of preferential electricity supplies and prices. Analysts anticipated that the power shortage throughout the country would continue until 2006 and would affect aluminum production in the eastern and northwestern parts of China.

In 2004, China consumed about 6 Mt of aluminum, and supply exceeded domestic demand. China was a net exporter of primary aluminum (707,843 t). China's aluminum metal production was expected to increase in the next couple years and supply would continue to exceed demand. The supply/demand gap will be smaller because of the shortage of alumina and the Government's restriction of investment in the aluminum sector (China Metal Bulletin, 2005c).

Owing to economic expansion, the production and consumption of copper in China continued to increase. The macroeconomic policy on fixed investment set up by the Government had little effect on the consumption of copper. Copper consumption increased because the demand from the construction, electrical appliance, and power sectors increased. In 2004, China's copper consumption was estimated to be 3.5 Mt, which accounted for about 24% of the world total. China overtook the United States to become the leading copper-consuming country in the world. Even with the strict macroeconomic control policy owing to the shortage of power supply, the Government encouraged investment in the power sector, which accounted for about one-half of China's total copper consumption. As a result of increasing demand, copper prices at the Shanghai Metal Exchange rose to 31,000 yuan ($3,748) per metric ton in December from 22,300 yuan ($2,696) per ton in January. Owing to the tight supply of copper in the domestic market, copper stocks at the State Material Reserve Bureau and smelters' warehouses decreased sharply. Domestic analysts estimated that the Government sold more than 200,000 t of copper metal from its reserve warehouses. Per capita copper consumption remained low compared with other developed economies, such as Japan, the United States, and Western Europe; China's copper consumption, however, was expected to increase continuously in this decade. China's output of copper cathode was expected to increase in the future, although the output of domestic copper mines could meet only less than 45% the copper smelters' needs; therefore, China was required to import large quantities of copper concentrates from, in decreasing order of quantity imported, Mongolia, Chile, Australia, and Peru. In 2004, China imported 3.96 Mt of copper scrap, 2.88 Mt of copper concentrates, and 1.20 Mt each of refined copper and semimanufactured copper products. Refined copper was imported mainly from Chile, Japan, Kazakhstan, and Russia, and copper scrap was imported from Hong Kong (imported from other countries and re-exported to China), Japan, and the United States. With limited copper resources, China's copper mine output was not expected to be maintained at its current level. Before the end of this decade, China will probably overtake Japan as the leading copper concentrates importer in the world. China's six leading copper producers planned to expand their output capacities and to increase their production in next 2 years. With the availability of more copper concentrates in 2005, copper treatment charge and refining charge was expected to be higher in 2005 compared with those of 2004. China's refined copper output was expected to reach 2.4 Mt in 2005 (China Nonferrous Metals Monthly, 2005).

China was the world's leading producer of pig iron and crude steel. Its crude steel output was slightly less than the combined total production of Japan, the United States, and Russia, which ranked second, third, and fourth, respectively, in the world. The increase crude steel production was mainly from pig iron production from blast furnaces. Because of the shortage of steel scrap and higher electricity prices, production of crude steel from electric arc furnaces accounted for only about 15% of total steel output. Low-grade steel products made up a large share of output. Except for high-quality steel products, output of the domestic steel sector basically could meet the domestic market demand. Imports of steel billet, slab, and finished steel had declined gradually, and exports of these increased slowly in the past several years. Pig iron and crude steel outputs were expected to increase in 2005; because of the Government's macroeconomic policy on investment, however, the rate of increase could be slightly slower than that of the past 2 years. The rate of steel consumption was lower than the rate of production in 2004, and if this trend were to continue, then domestic analysts expect that China would become a net exporter in the near future. The outputs of China's steel, crude steel, and pig iron products were expected to reach 350 Mt, 340 Mt, and 300 Mt, respectively, in 2005 (China Metals, 2005h).

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

China was the world's leading producer of lead and zinc. The metal production of lead and zinc continued to increase in 2004. The shortage of concentrates in China forced lead and zinc metal producers to increase their reliance on imported raw materials and were expected to continue in the future. In 2004, China's lead and zinc concentrates imports were 830,560 t and 616,074 t, respectively. China's lead and zinc bases are located in the Provinces of Guangdong, Guangxi, Hunan, Sichuan, and Yunnan. China's major lead producers were Shenzhen Nonfemet Co. Ltd., Yubei Metal Co., Yuguang Gold-Lead Co. Ltd., and Zhuye Torch Metals Co. Ltd. The major zinc producers were Baiyin Nonferrous Metals Co. Ltd., Huludao Zinc Smelting Co., Shenzhen Nonfemet Co. Ltd., and Zhuye Torch Metals Co. Ltd.

Owing to the increase of demand and shortage of concentrates, imports of refined zinc increased to 239,450 t in 2004 from 136,025 t in 2003, and exports decreased to 224,164 t in 2004 from 451,028 t in 2003. China became a net importer on refined zinc. Besides increasing domestic demand, the price difference between the domestic and international markets was another reason for increasing imports. The domestic zinc price was about $120 per ton higher than international zinc prices and the Government reduced the export VAT rebate to 11% in 2004 from 15% in 2003. Domestic zinc producers had less incentive to export their products. China was a net zinc importer of a total of 500,000 t (metal content). Imports of zinc concentrates were mainly from Australia, India, and Iran. China consumed about 2.6 Mt of zinc, and the demand for zinc was expected to increase in 2005 because of the construction of power-generating facilities and expansion of galvanized steel production (Lead, Zinc, and Tin Monthly, 2005b).

Trade

According to the Customs statistics, total trade was value at $1.15 trillion in 2004: this was an increase of 35.7% compared with that of 2003. Exports posted an increase of 35.4% to $593.4 billion, and imports went up by 36.0% to $561.4 billion. The United States remained the leading destination for China's exports, and Japan was China's leading importing country. Imports of raw materials, such as alumina, copper concentrates, iron ore, and oil, increased sharply. Owing to price increases in the international markets, the value of exports of coke, coal, and steel products increased by 169.8%, 42.6%, and 19.4%, respectively. In the first quarter of the year, the percentage of value of imports increased sharply; in the fourth quarter, however, the combination of slowing domestic demand and rapidly rising excess capacity had pushed Chinese imports of raw materials down sharply. Imports of machinery and equipment were flat, which reflected the deceleration of domestic investment spending (General Administration of Customs of the People's Republic of China, 2004, p. 2-63).

When China joined the WTO in 2001, the country agreed to extensive changes of its trade regime at all levels of Government and to implement a set of sweeping reforms that required the country to lower trade barriers in nearly every sector of the economy. China also agreed to special rules regarding subsidies and the operation of state-owned enterprises. Implementation of the changes was substantially complete by December 11, 2007. Since 2002, China has revised or enacted more than 1,000 laws, regulations, and measures to bring its trading system into compliance with WTO standards. China also agreed to implement a tariff reduction program through its bilateral negotiations with interested WTO members. China had reduced the average tariff rate to 7% in 2002 from 25% in 1997; this included theconstruction equipment, chemicals, machinery, and medical and scientific equipment that were the main exported commodities to China from Europe and the United States (U.S. Trade Representative, 2005, p. 1-86).

The Ministry of Commerce (MOC) issued a circular on the management of export license regulation in 2004. The State Council issued Decree No. 416 on the regulations on the origin of import and export commodities. According to the regulations, the MOC issued a list of commodities, which included ferrous and nonferrous metals, that required export quota license control in 2005. Mineral commodities that were on the Government's monitor list were ammonium paratungstate; bauxite and refractory clay; coal; coke; concentrates of antimony, tin, tungsten, and zinc; flurospar; oxides of antimony, magnesium, and tungsten; platinum; rare earths; silicon carbide; silver; talc; and unwrought and alloys of antimony, tin, and zinc. All antimony products must be registered and exported through the Ports of Beihai in Guangxi Zhuangzu Autonomous Region, Huangpo in Guangdong Province, and Tianjin. The Port of Dalian in Liaoning Province was designated as the port to issue export licenses for magnesia, which can be exported through the Ports of Changchun in Jilin Province, Dalian, Manshouli in Heilongjiang Province, and Qingdao in Shandong Province. The Government adjusted the 2005 export quota for coal to 80 Mt; coke, 14 Mt; oil products, 12 Mt; magnesia, 1.4 Mt; crude oil, 1 Mt; fluorspar, 750,000 t; talc, 650,000 t; zinc and zinc products (metal content) to 520,000 t; silicon carbide, 230,000 t; antimony and antimony products (metal content), 65,700 t; tin and tin products (metal content), 57,000 t; rare earths (rare-earth oxide equivalent), 50,000 t; tungsten and tungsten products (metal content), 16,300 t; and silver, 3,500 t. The import quota for ammonium phosphoric acid will be 6.56 Mt; complex fertilizer, 3.29 Mt, and urea, 2.8 Mt (Ministry of Commerce, 2004a-c).

With the approval of the State Council, the Ministry of Finance revoked the value-added tax (VAT) export rebate on aluminum and aluminum alloys, ferroalloys, nickel, phosphorus, and silicon carbide and imposed a 5% export tax on aluminum metal and refined copper and a 2% export tax on refined nickel beginning January 1, 2005. The tariff rate for aluminum scrap and waste, copper anode, scrap and waste will be levied at 10%. Starting on May 1, 2005, the VAT export rebate on products of antimony, coal, tin, tungsten, and zinc will be reduced to 8%. Also, the VAT export rebate on fluorspar, magnesia, molybdenum concentrates, rare-earth products, silicon metal, and talc will be reduced to zero. The export tax rate on yellow phosphorus will increase to 20% from 10%, and ferrosilicon, to 5% from 0% (Ministry of Finance, 2005).

China's General Administration of Quality Supervision Inspection and Quarantine required all scrap exporters to be licensed. Beginning on January 1, 2005, each exporter will have to demonstrate that it is an authorized operator and has a permanent office or plant. The exporter is required to be certified by local environmental authorities to qualify for a license to export scrap to China. Companies will have to submit to the Chinese authorities a document that explains which type of material is being shipped. The State Environmental Administration, State Customs, and the MOC banned the import of specific types of scrap and waste of aluminum, copper, steel, and vanadium for processing. Beginning on August 1, 2005, the Government will prohibit the import of iron ore, pig iron, steel ingot and scrap, rare-earth ore, and phosphate rock solely for export processing and required these commodities to be imported through normal trading (General Administration of Quality Supervision Inspection and Quarantine, 2004, p. 1-90; Ministry of Commerce, 2004d).

Commodity Review

Metals

Aluminum.—The State Environmental Protection Administration ordered five companies to halt the construction of their alumina plants in the Provinces of Henan and Shanxi because they failed to submit environmental appraisals. Henan Pingdingshan Huiyuan Chemical Industrial Co. completed the construction of its 300,000-metric-ton-per-year (t/yr) refinery in July 2004. Construction of the first 100,000-t/yr phase of Yixiang Aluminum Co.'s (a subsidiary of Henan Yimei Coal Group) 300,000-t/yr alumina project was completed at yearend 2004, and the trial run was expected to begin in 2005. The construction of a 400,000-t/yr plant for Shanxi Yangquan Coal Industry (Group) Co., a 300,000-t/yr plant for Shanxi Jiaokou Feimei Aluminum Co. (a Sino-foreign joint venture), and a 300,000-t/yr plant for Shanxi Tongde Aluminum Co. were underway in 2004. The Administration requested that these companies submit all required documents and be approved before resuming construction or operation (Alumina and Aluminum Monthly, 2005c; China Metals, 2005d).

The Government planned to allow more aluminum companies to import alumina for their own consumption. In addition to Chalco and Minmetals, the Government issued alumina import licences to six smelters—Baotou Aluminum Plant, Jiaozuo Wanfang Aluminum Co. Ltd., Lanzhou Aluminum Plant, Qingtongxia Aluminum Plant, Shanxi Guanlu Aluminum Co. Ltd., and Yunnan Aluminum Plant. Other smelters could either import alumina under processing trade or purchase alumina from Chalco or Minmetals. Alumina imports under processing trade were free from the 8% import duty and the 17% VAT. The processing trade accounted for about 70% of the country's total aluminum exports. The Government was considering abolishing the aluminum-processing trade in 2005 and issuing more alumina import licenses to some aluminum smelters. Smelters that were under consideration must have output capacities of more than 100,000 t/yr and must receive Government approval before being put into operation. Ciping Huaxin Aluminum Co. Ltd. and Longkou Donghai Aluminum Co. Ltd. in Shandong Province; Wanji Aluminum Co. Ltd., Zongfu Industry Co. Ltd., and Sanmenxi Tianyuan Aluminum Co. Ltd. in Henan Province; Lanzhou Liancheng Aluminum Smelter and Baiyin Honglu Aluminum Co. Ltd. in Gansu Province; Qinghai Qiaotou Aluminum Power Co. Ltd. in Qinghai Province; Fushun Aluminum Smelter in Liaoning Province; Tongchuan Xinguang Aluminum Co. Ltd. in Shaanxi Province; and Qimingxing Aluminum Co. Ltd. and Qiya Aluminum Co. Ltd. in Sichuan Province received alumina import licenses (China Metals, 2005e).

China's sole metallurgical-grade alumina producer, Chalco, planned to increase alumina output to 7.2 Mt in 2005. The increase of alumina production will come from its refineries in the Provinces of Guangxi, Guizhou, Henan, Shandong, and Shanxi. The third-phase alumina expansion of Pingguo Aluminum Co. will increase its total output capacity to 1.2 Mt/yr. Guizhou Aluminum Plant (or Guizhou Co.) will add 300,000 t/yr to its current output capacity in 2005 and will expand to 1.2 Mt/yr in 2008. Part of a 700,000-t/yr production-capacity expansion will be commissioned at Zhengzhou Aluminum Plant (or Henan Co.) in October 2005. After completed expansion, Zhengzhou will have a total alumina output capacity of 2 Mt/yr. The second 300,000-t/yr bauxite dressing/Bayer process line at Zhongzhou Aluminum Plant will be completed in June 2005. The renovation of Shandong Aluminum Plant's (or Shandong Co.'s) refinery was completed in 2004; the company planned to add another 300,000-t/yr Bayer process line in 2005. The Government approved Chalco's joint-venture company, Guangxi Guixi Huayin Aluminum Co. Ltd.'s, plan to build a 1.6-Mt/yr alumina refinery in Debao County of Bose (Baise) City, Guangxi Zhuang Autonomous Region. The construction of the first-phase 800,000-t/yr refinery was scheduled to begin in 2004 and was expected to be completed in 2007 (China Metal Bulletin, 2004a).

To secure the supply of alumina, several companies either began or planned construction of alumina refineries in the Provinces of Henan, Shandong, and Shanxi. Chalco, the Xinzhou City Government, and the Luneng Group formed a joint venture, Luneng Jinbei Aluminum Industry Co. Ltd., to build a 2-Mt/yr refinery at Xinzhou, Shanxi Province. The first phase of the 1-Mt/yr refinery was scheduled to be completed in 2006. Chalco joined with Bosai Aluminum Co. and others to build a 800,000-t/yr refinery in Chongqing City. The East

Hope Group's 1.05-Mt/yr refinery was under construction in Minchi, Henan Province, and the first phase of 350,000 t/yr was scheduled to be completed in 2005. Xinan Aluminum Co.'s 800,000-t/yr refinery at Xinan, Henan Province, was scheduled to be commissioned in 2005. Baofeng Aluminum Co., which was a joint venture between the Shenhuo Group and local companies, planned to build a 1.05-Mt/yr alumina refinery at Baofeng, Henan Province, and the first phase of 350,000-t/yr was scheduled to be put into operation in 2005. Kaili Aluminum Co. planned to expand its alumina output capacity to 600,000 t/yr by 2005. Lianyungang Aluminum Co., which was a joint venture of Liancheng Aluminum Plant, Shaanxi Changxin International Trade Co., the Lianyungang Port Administration, and Lianyunggang Economic and Technology Development Zone, intended to build a 1.2-Mt/yr alumina refinery at Lianyungang, Jiangsu Province. The first-phase plan was to build a 500,000-t/yr refinery by 2007. The Shandong Nanshan Group planned to build a 1-Mt/yr alumina refinery at Longkou, Shandong Province, by 2007. Dengfeng Power Plant Group Co. Ltd. and Henan Wuzhou Aluminum Co. Ltd. planned to invest $370 million to build a 1.2-Mt/yr alumina refinery at Dengfeng City, Henan Province; construction was to begin in 2005. The Central Government had not approved every individual project. In 2004, the National Development and Reform Commission issued a circular to local Development and Reform Committees and Aluminum Corporation of China (Chinalco) (the parent company of Chalco) that ordered them to shut down unapproved alumina projects in their regions. Development of alumina projects was subject to the guidance of the Central Government's development plan. State-owned banks were not allowed to provide loans, and the land administration departments were not to issue land-use licenses to the unapproved projects (Alumina and Aluminum Monthly, 2005b; China Metal Bulletin, 2005d).

In December 2004, Baiyin Nonferrous Metals Co. Ltd. started the construction of its aluminum fluoride plant at Baiyin, Gansu Province. Construction will take at least 2 years. The plant was designed to produce 30,000 t/yr of aluminum trifluoride through dry-processing technology and would replace wet-processing technology. The wet-processing route was energy intensive and polluted the environment. The Government planned to retire all aluminum fluoride production that used wet-processing technology (Interfax Information Services, 2004a).

In 2003, China and Vietnam signed a memorandum of understanding for the joint development of the bauxite resources in Dac Nong, Vietnam. In 2004, Chalco completed the feasibility study on the alumina project at Dac Nong and submitted it to the Vietnamese Government for approval. The feasibility study included the construction of a bauxite mine and a 1-Mt/yr alumina refinery at an estimated of $870 million. Chalco and China Nonferrous Metal Mining and Construction Group Co. Ltd. will take part in the project (Alumina and Aluminum Monthly, 2004).

Chalco and Companhia Vale do Rio Doce (CVRD) of Brazilformed the 50/50 joint-venture Aluminio Brasil China Refinery to build an alumina refinery in Brazil. The initial 1.8-Mt/yr refinery will be located in Barcarena, State of Para, and the cost was estimated to be $800 million. The refinery was scheduled to put into operation in 2007, and all its output would be exported to China. CVRD planned to increase the refinery output capacity to 7.2 Mt/yr in the future (China Metals, 2004a).

The Government planned to close down Soderberg cell aluminum potlines by 2005. At yearend 2003, 64 smelters were using Soderberg cells to produce aluminum metal and had a total output capacity of 1.12 Mt. About 300,000 t of aluminum output capacity was closed in 2004. Liancheng and Qingtongxia Aluminum Plants will close down their Soderberg cell potlines in 2005 (China Metals, 2004c).

Shanglin Nannan Industry Co. Ltd., which was a joint venture of Guangxi Nannan Aluminum Co. Ltd., Nanning High-Technology Development and Investment Co. Ltd., Nanning Energy Development Corp., Shanglin Coal-Fire Power Plant, Shanglin Mushan Coal Mine, and Shanglin Coal Industry Co. Ltd., planned to build a 1.1-Mt/yr coal mine, a 100,000-t/yr aluminum smelter, and a 214,000-kilowatt powerplant in Shanglin County, Guangxi Zhuang Autonomous Region. Guangxi Nannan Aluminum had a 10,000-t/yr Soderberg cell smelter; owing to environmental problems, however, the smelter was ordered by the Government to close down. The local government approved a new prebaked cell smelter to be built by Guangxi Nannan Aluminum in another location (Alumina and Aluminum Monthly, 2005a).

Antimony.—Since the mine accident in Nandan and the crackdown on illegal exports in 2001, the world market price of antimony has increased by more than twofold from $1,100 per metric ton at yearend 2001. Because of slow economic growth in Japan, Europe, and the United States, international antimony prices were maintained in the range of $2,000 to $2,400 per ton throughout 2003. As economic activities in Europe, Japan, and the United States slowly recovered in 2004, the antimony price in the world market increased to about $3,000 per ton at yearend 2004. China's antimony metal production continued under the Government's tight control. Before 2001, mines in the Guangxi Zhuang Autonomous Region produced more than 50,000 t of antimony in concentrates; this total excluded production from illegal miners. Since then, mine output from this area has decreased by more than 50%. In 2003, the Government approved the reopening of five mines in the Nandan area, but only two mines, Chashan and Gaofeng, have antimony resources, and mine output from the Guangxi Zhuang Autonomous Region would unlikely reach the 2001 level. During the past 3 years, the official statistical data for antimony concentrates have been questionable. Reported antimony output from mines was lower than that of antimony metal output. To meet demand, the shortage of antimony concentrates was assumed to have come from the mine producers' stockpiles and to have been supplemented by imported concentrates. In 2004, the country imported 17,984 t antimony concentrates mainly from, in order of tonnage, Russia, Tajikistan, Kazakhstan, and Burma. Exports of antimony oxide increased by 28.2% to 49,251 t, but antimony ingot exports decreased by 14.9% to 21,488 t. Japan was the leading antimony-importing country followed by the Netherlands. Hunan Province replaced the Guangxi Zhuang Autonomous Region as the leading antimony-producing Province in China (Precious and Minor Metals Monthly, 2005b).

Cobalt.—China's demand for cobalt had increased sharply in the past decade. China was one of the leading mobile phone producers in the world. The demand for cobalt batteries has driven the rapid expansion of cobalt-refining facilities in China. Despite limited cobalt resources, China continued to expand its refined cobalt output capacity in the past several years. The Jinchuan Nonferrous Group expanded its refined cobalt output capacity to 4,000 t in 2005 and planned to increase it to 8,000 t in 2010. In 2004, Jinchuan produced about 2,280 t of cobalt (metal content) products, of which cobalt metal accounted for about 800 t. Owing to increased demand from cobalt salt producers, China's cobalt concentrates imports increased to 143,594 t in 2004 from 83,468 t in 2003; the Democratic Republic of the Congo accounted for 90% of the total imports. China consumed about 9,500 t of cobalt—the battery sector accounted for 57% of the total followed by the glazing sector, 14%; cemented carbide, 11%; magnetic, 8%; and others, 10%. Consumption of cobalt in the battery sector was expected to increase in the future (Precious and Minor Metals Monthly, 2005a).

Copper.—China's leading copper producer Jiangxi Copper Co. Ltd. planned to expand its copper cathode capacity by 400,000 t to 700,000 t and also planned to increase copper semimanufactured products to 370,000 t; silver, to 400 t; and gold, to 20 t in 2007. At yearend 2004, Jiangxi Copper had a designed copper-refining output capacity of 400,000 t and produced 415,051 t of copper cathode. Its mines' total output was 157,347 t copper in concentrate. The company planned to produce 450,000 t of copper cathode, 320 t of silver, 12 t of gold, and 1.0 Mt of sulfuric acid in 2005. The company also planned to expand the mining and processing output capacity at the Wujiawu, the Wushan, and the Yinshan Mines to increase copper concentrate supply from its own mines. Jiangxi Copper had to source more than 50% copper concentrates from domestic and overseas markets to meet its needs. Jiangxi Copper and the Bank of China signed an agreement to establish Jiangxi Copper Group Finance Management Co. Ltd. to strengthen capital management at Jiangxi Copper. Jiangxi Copper also signed a purchase agreement with China Metallurgical Construction Corp. (MCC). For 10 years starting in 2005, MCC will sell 16,000 t/yr of blister copper from its Saindak smelter in Pakistan to Jiangxi Copper. The Saindak smelter had an output capacity of 20,000 t/yr (China Metals, 2004b; Interfax Information Services, 2005c).

Xinjiang Jinyu Corp. at Alataw Shankou, Xinjiang Uygur Autonomous Region, and Kazakh Kazakhmys Corp. of Kazakhstan signed a cooperation agreement to develop the Aktogay-Aidarly copper mine in eastern Kazakhstan. The copper deposit was discovered in the 1930s, and on-property exploration, development, and initial exploitation were conducted in late 1950s. The Aktogay-Aidarly area has substantial copper reserves and also contains significant quantities of gold, iron, molybdenum, and silver. After prospecting and feasibility studies are completed, mine construction could begin in 2006. The total investment was estimated to be $2 billion because the mine is located in a remote desert area, and infrastructure must be built before the mine is developed (Interfax Information Services, 2005e).

China's second ranked copper producer was Tongling Nonferrous Metals (Group) Co. Tongling's subsidiary Jinlong Copper Co., which was a joint venture with Sumitomo Metal Mining Co. Ltd. of Japan, completed a renovation/expansion project 3 months ahead of schedule. The smelting plant suspended production for more than 1 month, but the refining plant remained in operation. The copper cathode output capacity increased to 210,000 t/yr. Jinlong planned to produce 185,000 t of copper cathode in 2005. The construction of Tongling's Donguashan Mine was expected to be completed in September 2004. The mine was designed to produce 30,000 t/yr of copper in concentrates, which would be consumed by Tongling's subsidiary Tongdu Copper Co.'s smelters. In 2005, Tongling planned to produce about 400,000 t of copper cathode from its three smelters/refineries (Jingchang, Jinlong, and Zhangjiagang). Tongdu planned to issue $120 million in convertible bonds to finance its two downstream projects with Viceroy Capital of Canada—60,000 t/yr of copper sheet/strip and 40,000 t/yr of electronic copper strip (China Metal Bulletin, 2005b; China Metals, 2005f).

The Government of Hubei Province signed agreement to sell its 85% share of Daye Nonferrous Metals Co. at Hunagshi, Hubei Province, to Chinalco. In 2004, Daye had a design output capacity of 200,000 t of blister copper and 160,000 t copper cathode and planned to increase copper cathode output to 200,000 t in 2006. Under the terms of the agreement, Daye will become a subsidiary of Chinalco, but it will operate independently in production, sales, and foreign trade. The Hubei Provincial Government will continue to provide preferential incentives to Daye. Chinalco will contribute at least 40% of the total investment in Daye's 100,000-t/yr high-precision copper sheet/strip project (Copper and Nickel Monthly, 2004a).

In August 2004, Rongda Copper Co. Ltd., which was a joint venture of Gunagxi Debao Copper Mine, Guangxi Huali Chemical Engineering Co. Ltd., and Zhangjiagang United Copper Co. Ltd. (a subsidiary of Tongling), completed its 5,000-t/yr copper smelter in Baise City, Guangxi Zhuang Autonomous Region. The construction cost was $2.4 million. Copper ore was sourced from local copper mine producers. Rongda's output will be shipped to Zhangjiagang to be refined. The company planned to expand the output capacity to 20,000 t/yr in the future (Copper and Nickel Monthly, 2004b).

After 16 months of construction, Shandong Jinsheng Nonferrous Metals Corp., which was located at Linyi City, Shandong Province, completed its $10.2 million copper expansion project in October 2004. The copper cathode output capacity increased by 80,000 t to 100,000 t/yr. Blister copper increased to 400 metric tons per day (t/d). The company planned to import a copper wire rod line from Germany, which was capable of producing 65,000 t/yr of high-quality copper wire (China Metal Bulletin, 2004b).

Zijin Mining Group Co. Ltd., which was a Fujian Province-based gold company, invested $30 million in a joint venture to develop the Yulong copper deposit in Xizang Autonomous Region. Other investors included No. Geologic Team of Xizang Geology and Mining Survey Bureau, Western Mining Co. Ltd., and Xizang Changdu State-Owned Assets Administration. The joint-venture company Xizang Yulong Copper Co. Ltd. will be established to oversee the development of the Yulong deposit, which has proven reserves of 6.5 Mt of copper. Western Mining held 41% of the shares of the company, and Zijin controlled 39% shares (Copper and Nickel Monthly, 2005c).

Gold, Platinum-Group Metals, and Silver.—China's gold production was controlled by the Government prior to 2002. Since then, gold producers could sell their gold through Shanghai Gold Exchange, but exports and imports of gold ingot remained under Government control. In 2004, the China Gold Association (CGA) reported that the country produced 212.35 t of gold and that gold mine producers produced 170.89 t. Previously, gold output from gold mines accounted for about 80% of the total, and nonferrous metal mines contributed about 20%. In recent years, the production of nonferrous metal mines, such as copper, lead, and zinc, gradually increased; therefore, the share of gold production from these mines might increase slightly. The NSB indicated that gold output reached 265.04 t in 2004. When the Gold Bureau was abolished in 2003, the CGA was established to take over the responsibility for collecting gold production data. China's gold ingot was produced from domestic and imported ore. In the past several years, imports of copper, lead, and zinc concentrates increased. The CGA might only collect production data on gold producers and large nonferrous metal producers; this could contribute to the difference between the CGA and the NSB data. Shandong Province remained the leading gold-producing Province in China followed by the Provinces of Henan, Fujain, Shaanxi, Liaoning, and Hebei. In the past several years, the World Gold Council reported that China consumed between 200 and 230 t/yr; domestic gold analysts, however, estimated that gold consumption in China reached 300 t. Because the Government published gold output data but withheld gold bullion import and export data, ascertaining reliable gold-consumption figures was difficult (China Gold Association, 2005; China Metal Bulletin, 2005e).

In 2004, Guoda Gold Refining (Group) Co. Ltd., which was located in Zhaoyuan City, Shandong Province, through its subsidiary, North Korea-Sino Guoda Mining Co., signed an agreement with the Foreign Trade and Economics Development Commission of North Korea to develop the Yunshan Gold Mine near Shang Nong Mountain in North Korea. Recoverable gold reserves were estimated to be 150 t. In the past several years owing to lacks of funding and equipment, mine operation had been suspended. Guoda planned to expand mining and processing output capacity to 1,000 t/d, and concentrate outputs would be shipped to Guoda's plant in China for smelting and refining (Interfax Information Services, 2004b).

Anglo American Plc of the United Kingdom signed an agreement with Sichuan Geology and Mining Co. (a subsidiary of Sichuan Provincial Bureau of Geology and Mineral Resources) to establish a joint-venture company to prospect for platinum resources in the Danba-Panxi area. Anglo American will invest $20 million and will have 51% in the joint venture. The Danba-Panxi area is considered to be a large metallogeneric region in China, and Anglo Platinum Co. (a subsidiary of Anglo American) thought that valuable platinum resources could be discovered in the area (Precious and Minor Metals, 2004).

Since 2000, China's silver output has increased sharply. Silver output from mines increased to more than 2,000 t in 2002 from 625 t in 1993. In 2003, when the Government decided to include secondary silver production in its survey, silver output increased to 4,305 t in 2003 and 6,087 t in 2004. The Provinces of Hunan, Henan, and Yunnan accounted for 58% of the total output. Silver from copper, lead, and zinc mines accounted for 60% to 70% of the total. In China, some smelters did not recover silver from anode slime and sold it to slime collectors. Smelters estimated the recoverable silver content in the slime and reported to the NSB; slime collectors also reported how much they recovered to the NBS. This might cause double counting in the NSB's survey data. The Government approved 37 silver producers and traders to export 3,500 t of silver in 2005, which was 450 t more than that 2004. China's silver consumption increased to 2,300 t in 2004 from 2,000 t in 2003. Electronics accounted for 35% of the total consumption followed by photosensitive material, 20%; jewelry, 10%; and others, 15% (China Metal Bulletin, 2005h).

Indium.—China was one the major indium-producing countries in the world. Indium was mainly recovered as a byproduct of zinc operations. In the past 2 years owing to mine closures, exhausted resources, and the shortage of electricity, China's indium output was unpredictable. The Government of Hunan Province, which accounted for one-third of the country's total output, ordered 12 local indium producers in the Zhuzhou area to shut down their operations temporarily because their discharged waste polluted the Xiangjiang (Xiang River) and threatened the potable water supply for Changsha City. The Hunan Government also closed down several small indium producers in the Province permanently. Owing to an inadequate supply of raw material, Liuzhou Zinc Products Co. Ltd. and Liuzhou High-Tech Zone Indium Smeltery Co. Ltd. shut down their refining facilities in late 2003 and early 2004. China's largest indium producer, Liuzhou Huaxi (China Tin) Tin Group Co. Ltd., planned to produce slightly more than 30 t in 2005, which was less than that of 2000. The Huludao Zinc Plant and the Zhuzhou Smelter planned to increase their indium output in 2005. Because demand exceeded supply in the world market, the spot price of indium increased to about $800 per kilogram in December 2004 from $300 per kilogram in January 2004. Analysts predicted that the indium price would be more than $1,000 per kilogram in 2005 (China Metal Bulletin, 2005a; China Metals, 2005j).

Iron and Steel.—To curb rolled steel expansion and investment, the Government planned to abolish the export VAT rebate on slab and billet on April 1, 2005, and to reduce the export VAT rebate on other steel products to 11% and was considering the elimination of all rolled steel rebates in the coming year. The Central Government also ordered local governments to fund 25% of the VAT rebate as a way to relieve the Central Government's financial burden and to discourage local government support for local steel companies that expand their production. The State Council ordered the State Development and Reform Commission to draft a new policy and guidelines on the development of the steel sector and was scheduled to be released in the second half of 2005. The new policy will encourage consolidation through mergers and acquisitions. Capacity expansion through technical renovation of existing facilities will be encouraged. The Government will not allow foreign investors to hold majority interests in steel companies in China (China Metals, 2005b).

In the past several years, the rates of pig iron and crude steel expansion were much faster than that of iron ore; therefore, China relied on iron ore imports to meet its demand. More than 700 registered and unregistered iron mines were active in China and had a total output capacity more than 300 Mt/yr. China was the leading iron-ore-producing country in terms of gross weight in the world; the average iron content in the ore, however, was 33%. China ranked behind Brazil and Australia in metal content weight. In the past decade, China's iron and steel producers expanded their output capacities through either technical renovation or replacement of old small furnaces with larger ones. By yearend 2004, the total pig iron output reached more than 300 Mt. Domestic iron ore output could not meet internal demands, and it contained higher impurities. Steel producers, which produced high-value-added steel products, such as automotive sheets, preferred imported ore. With the Government's encouragement and approval, China's iron and steel producers looked overseas to secure iron ore supplies. China's iron and steel producers, such as the Anshan Iron and Steel Group (Angang), the Baoshan Iron and Steel Group (Baogang), Shagang, the Shoudu Iron and Steel Group (Shougang), and Wuhan Iron and Steel Group (Wugang), signed joint-development agreements with companies in Australia and Brazil. In the next several years, iron mines, such as Gaocun and Longqiao in Anhui Province, Heigou in Gansu Province, Mengjiagou, Nanminghe, and Sijiayin in Hebei Province, Hujiamiaozi in Liaoning Province, Shuijigou in Nei Mongol Autonomous Region, Liguanji in Shandong Province, and Baima and Hongge in Sichuan Province, were scheduled to begin operations, but domestic iron ore output could not meet domestic demand. In 2005, the volume of China's iron ore imports was expected to exceed that of 2004. According to the Customs General Administration, more than 40 Mt of iron ore was stockpiled in ports at yearend 2004. In response to the widespread problem of substandard ore imports and excessive importing and to control bidding prices by domestic traders, the Government issued a series of policies to tighten control of iron ore importers. The MOC established an "automatic import licensing measures for management of cargo" system and issued 118 iron ore import licenses to domestic companies (China Metals, 2005a; Interfax Information Services, 2005d).

The demand for galvanized sheet has increased gradually in the past decade. Domestic steel producers expanded their output capacities to meet domestic needs. Galvanized sheet output increased to 2.7 Mt in 2003 from 62,000 t in 1997. At yearend 2004, galvanized sheet output capacity was 10 Mt. In 2003, China had imported 5.4 Mt and exported 60,000 t of galvanized sheet. In 2004, the country produced about 4.2 Mt and consumed about 9.0 Mt. Automobiles, construction, and electronic appliances were major consumers of galvanized sheet. Imported galvanized sheets were those that required high-quality control and the extra-thin coating sheets that China could not produce. Major cold-rolled galvanized sheet producers were Angang, Baogang, Benxi Iron and Steel Co., the Guangdong Iron and Steel Group's (Guanggang), Handan Iron and Steel General Work, Panzhihua Iron and Steel (Group) Co., Ma'anshan Iron and Steel Co., Shougang, and Wugang. Baogang was the only domestic producer of electrozinc coat sheet; other companies produced hot-dipped galvanized sheet. Production of galvanized sheet was expected to increase to 8 Mt in 2006 and 15 Mt in 2010. The demand for galvanized products was expected to reach 10 Mt in 2005 and 15 Mt in 2010 (China Metal Bulletin, 2004c).

Wugang and the Government of Guangxi Zhuang Autonomous Region signed an agreement to build a 10-Mt/yr iron and steel plant, a 5-Mt/yr coke plant, and a 2.4-megawatt thermal powerplant in Fangchenggang; Fangchenggang is located on the coast and is an ideal location for importing iron ore and exporting steel products. A 200,000-deadweight-ton (dwt) iron ore berth was under construction at the Port of Fangchenggang. The Committee of the Economic and Trade Commission approved the feasibility study of the iron and steel plant. The first-phase plan was designed to produce 7.17 Mt of steel products; construction cost was estimated to be $7.15 billion. Steel products output capacity will expand to 10.78 Mt. Local steel demand in Guangxi reached 6 Mt and was expected to increase in the next several years, but Guangxi's largest steel producer Liuzhou Iron and Steel Group had only 4 Mt/yr of output capacity. Wuhan and the Government of Guangxi Zhuang Autonomous Republic signed a letter of intent to merge with Liuzhou. Liuzhou planned to expand its crude steel output capacity to 6 Mt/yr. The Government of Hubei Province transferred 51% of the Ercheng Steel Plant to Wugang. Wugang completed its sixth blast furnace in July to increase its total pig iron output capacity to more than 10 Mt and planned to expand its crude steel output capacity to 20 Mt by 2010 (China Metals, 2005i).

The Guangdong Provincial Government submitted a 10-Mt/yr steel project to the National Development and Reform Commission for approval. The steel plant will be located in Zhanjiang. The East Sea island of Zhanjiang had a 300,000-dwt ship dock and a 500,000-dwt oil tanker dock; a 200,000-dwt iron ore berth was under construction. Angang and Baogang showed interest in participating in the development of the project. The Guangdong Provincial Government planned for Guanggang to relocate iron and steel plants to the Nansha Industrial Zone from the urban area in Guangzhou and to expand its output capacity to 10 Mt. Guanggang and JFE Steel Corp. of Japan signed an agreement to build a hot-dip galvanized steel sheet plant as a part of the relocation project. Steel products consumption in Guangdong reached 28 Mt in 2004, but local steel producers could supply only about 7 Mt (Interfax Information Services, 2004d).

Because of environmental concerns and the 2008 Beijing Olympic Games, the Central Government and the Beijing City Government urged Shougang to reduce its output capacity in Shijingshan, Beijing, and to move production facilities to Hebei Province. Shougang had planned to close down its production facilities at Shijingshan completely in 2012. To replace the existing production facilities, Shougang built a 4.5-Mt/yr steel production plant in Qian'an, Hebei Province, and the first-phase 2 Mt/yr of steel output capacity was put into operation in 2004.

Shougang also planned to build a 15-Mt/yr greenfield iron and steel facility in Caofeidian and to expand its medium-plate mill in Qinhuangdao to 4 Mt/yr from 400,000 t/yr. The Port of Caofeidian had the capability to handle 30 Mt/yr of iron ore, 8 Mt/yr of coke, and 5 Mt/yr of steel products. Shougang and the Tangshan Iron and Steel Group jointly planned to build a 300,000-dwt iron ore berth in the Port of Qinhuangdao (China Metals, 2005g).

China's second ranked steel producer Angang planned to build a 10-Mt/yr greenfield steel facility in Bayuquan District, Yingkou City, Liaoning Province. Angang imported about 10 Mt/yr iron ore through the Ports of Dalian and Yingkou. Construction of a new plant in Yingkou will reduce transportation costs. The local government had allocated land for Angang to use. The construction of the first-phase 5-Mt/yr of steel output capacity was underway and was scheduled to be put into operation in October 2006. Angang also planned to add 5 Mt/yr of steel output capacity its production facility in Anshan (China Metals, 2005g).

Lead and Zinc.—The leading lead producer Yugang Gold-Lead Co. Ltd. postponed the startup of its 100,000-t/yr zinc smelter to May 2005 from the initially scheduled December 2004. The roasters of the electrolytic zinc production line were put on a trial run in December, but the electrolytic system had not been completely installed. The construction of the smelter began in August 2003; the total investment was $104 million. Yuguang purchased two lead and zinc mines in the Nei Mongol Autonomous Region and Sichuan Province and also signed long-term purchase contracts with lead and zinc mines in the Provinces of Gansu and Sichuan and the Nei Mongol Autonomous Region. Because these mines were expected to supply only about 40% of its needs, the company intended to source remaining raw materials from overseas markets (China Metals, 2004d).

Xinlin Lead Co. (a subsidiary of Lingye Co. Ltd.) started construction of its 100,000-t/yr lead smelter in Lingbao City, Henan Province. The $38 million smelter will use oxygen bottom blown smelting blast furnace reduction technology, which was designed by the China Nonferrous Engineering and Research Institute. Construction was scheduled to be completed in 2006. In addition to lead, the smelter will recover 100,000 t/yr of sulfuric acid (China Metals, 2005k).

In December 2004, China Nonferrous Metal Industry Foreign Engineering and Construction Co. (NFC) signed an agreement with the Government of Chifeng City, Nei Mongol Autonomous Region. According to the terms of the agreement, NFC will build a zinc smelter in the city to process zinc concentrates from NFC's zinc mine in Sukbataar Province, Mongolia. The partners will conduct geologic prospecting, mining, and smelting in the Chifeng area. NFC will provide capital and equipment to increase the city's zinc-smelting capacity to 100,000 t/yr and finally to 200,000 t/yr (Lead, Zinc, and Tin Monthly, 2005c).

Magnesium.—China was the leading magnesium-producing country in the world. Magnesium metal output accounted for more than 60% of the world total. The country exported more than two-thirds of its output. In 2004, China exported 383,738 t of magnesium products, of which 228,350 t was metal. Since 2001, when several magnesium plants in Europe and North America shut down, China's magnesium filled in the gap of supply and demand for these two areas. China exported about 40% of its magnesium products to European countries followed by such Asian countries as Japan, the Republic of Korea, and Taiwan. During the past 5 years, China's magnesium producers expanded their output capacities. The total output capacity of alloy, granule, and metal increased to 700,000 t in 2004, and the output capacity was expected to expand in the next couple of years. During the past decade, the price of magnesium ingot decreased to about $2,100 per ton in 2004 from $4,000 per ton in 1995. With the increase of production costs and price decline, the profit margin for Chinese magnesium producers has become smaller in the past couple years. The Provinces of Shanxi, Henan, and Ningxia accounted for 94% of the country's total magnesium output (China Metal Bulletin, 2005f).

Nickel.—The stainless steel sector was the major consumer of nickel, which accounted for about 41% of total nickel consumption. In 2004, the output of stainless steel increased to about 2.36 Mt and was expected to grow at an average rate of more than 10% per year during the next several years. The electroplating sector was the second ranked nickel consumer and accounted for 32% of the total. Because China's demand for nickel exceeded its output, the country imported a large quantity of nickel to meet its demand. In 2004, China imported 65,460 t of refined nickel, 42,590 t of nickel concentrates, 34,034 t of ferronickel, and 12,247 t of nickel matte. China exported 15,420 t of refined nickel mainly from tolling trade. China consumed about 145,000 t of nickel in 2004. Because several stainless steel producers expanded their outputs during the past 2 years, nickel consumption was expected to increase to 170,000 t in 2005. China's steel producers and traders were actively sourcing nickel resources from such countries as Australia, Cuba, Papua New Guinea, and the Philippines (China Metal Bulletin, 2005g).

Baogang, Jinchuan Nonferrous Metal Corp. (Jinchuan), and Taiyuan Iron and Steel Co. (Taigang) formed a strategic alliance. The Government of Gansu Province transferred 10% of its shares of Jinchuan Group Ltd. to Baogang and Taigang; Baogang was the largest steel producer, and Taigang was the largest stainless steel producer in China. Baogang and Jinchuan signed a strategic cooperation agreement in 2003 and planned to explore for nickel resources in the Philippines. Taigang signed a long-term nickel supply agreement with Jinchuan in 2000 and a cooperation agreement in 2002. Jinchuan planned to increase refined nickel production to 150,000 t/yr in 2008 and to produce 90,000 t of refined nickel and 30,000 t nickel sulfate in 2005. Jinchuan had long-term nickel concentrates supply agreements with Fox Resources Ltd. of Australia, Glencore International AG of Switzerland, and Sally Malay Mining Ltd. of Australia (Copper and Nickel Monthly, 2005a).

Yunnan Tin Corp., which was the leading tin producer, and Yunnan Kunneng Co. Ltd. agreed to form the joint-venture company Yuanjiang Nickel Co. Ltd. Yunnan Tin will invest more than $12 million and hold 57% of the shares in the joint venture. Yuanjiang will develop the lateritic deposit, Yuanjiang, which has reserves of 530,000 t of nickel and is located in Yuxi, Yunnan Province. The company will use the pressure acid leaching method to extract nickel from the lateritic ore and will build a 5,000-t/yr smelter; capacity will be expanded to 100,000 t/yr in the future (Copper and Nickel Monthly, 2005b).

Tin.—China was the leading tin-producing country in the world. Because of strong domestic and international demand, tin prices in both markets increased. Because the supply of concentrates increased, output of tin metal increased in 2004 compared with that of 2003. Imports of tin concentrates increased to 8,912 t in 2004 from 2,739 t in 2003. China's refined tin exports, however, increased slightly to 32,032 t, and tin alloy exports decreased to 6,993 t. Because of the recovery of the global economy, domestic analysts predicted that tin metal prices would remain at 2004 levels. Owing to the increase in domestic demand for refined tin, the volume of tin exports from China could drop to less than 30,000 t in 2005. China's tin consumption increased to 83,000 t, of which tin solder accounted for 50%. Supply of tin concentrates from domestic mines was expected to remain tight, and imports of tin concentrates were expected to increase in 2005. China could become a net tin importer in the near future (Lead, Zinc, and Tin Monthly, 2005a).

Industrial Minerals

Cement.—China was the leading cement-producing country in the world and accounted for more than 40% of the world's total. Even with the Government's restricted investment policy for the cement sector, cement output continued to increase. China's cement consumption was driven by infrastructure investment and residential and nonresidential construction. The Government's continued emphasis on large infrastructure projects included bridges, dams, roads, and utilities. In 2003, the Government restricted investment on residential construction to prevent overheating in the real estate market; nonresidential construction, however, was expected to be less affected. Low-grade cement (325 or lower) production accounted for 60% of the total. The output of medium-grade cement (425), which was used for high-rise buildings, roads, and bridges in China, was about 35%. High-grade cement (525), which was used for powerplants, had a market share of 5%. In China, for each metric ton of clinker produced, 728 kilograms (kg) of carbon dioxide was produced, and for each ton of cement produced, 1.58 kg of sulfur dioxide and 1.03 kg of nitrous oxide were emitted (Ministry of Commerce, 2005a). The Government encouraged cement producers to produce more medium- and high-grade cement to meet the demand. The Government stepped up its efforts to shut down plants that used obsolete technology and encouraged cement producers to use dry rotary kilns. Output of cement from dry rotary kilns accounted for about 14% of the total.

Lithium.—In May 2004, Jihai Lithium Ltd., which was a joint venture between Sterling Group Venture Inc. of Canada (75%) and Sichuan Province Mining Ltd. (25%), received a mining permit from the Bureau of Land and Resources of Sichuan Province. The Development and Reform Commission of Sichuan Province also approved the establishment of the joint-venture company in August. Jihai planned to develop the Jiajika lithium deposit, which is located 70 kilometers (km) from Kangding County, Sichuan Province. The deposit was evaluated from 1959 to 1992 by several exploration teams in Sichuan Province. The deposit had 74 lithium-bearing veins and contained more than 450,000 t of lithium, 17,000 t of beryllium oxide, 4,500 t of niobium oxide, and 2,200 t of tantalum oxide. Initially, the company planned to process 240,000 t/yr of ore and to produce 47,320 t of lithium concentrates. The China Nonferrous Engineering and Research Institute received the contract to design and perform the feasibility study for this project. The Sichuan Research Academy of Environmental Science conducted the environmental impact and water preservation study of the deposit (Sterling Group Venture Inc., 2004).

Magnesium.—China was one of the leading magnesite-producing countries in the world. Although the demand for magnesite products from construction and steel sectors has increased in the past several years, production of magnesite products has decreased. China produced about 1.15 Mt of magnesite products, which was 18.2% less than that of 2003; the average price per metric ton, however, increased by 18.2% in 2004. Magnesite was mainly from Liaoning Province. After more than two decades of exploitation, the gradual depletion of high-grade ore has affected the quality of downstream products. The total impurity content, such as ferrous oxide and silicon oxide in grade 97 crystallized magnesite, had increased to 0.65% from 0.6%. Many domestic producers had difficulty maintaining a total impurity content of under 0.7%. The iron content in grade 94 light-burned magnesite increased to 0.55% from 0.40%. The Government encouraged magnesite producers to produce more high-value-added magnesium products and shut down 343 furnaces to reduce pollution in Liaoning Province in 2004 (Ministry of Commerce, 2005b).

Mineral Fuels

Coal.—Mine safety continued to be a major problem for the Chinese Government. The State Administration of Coal Mine Safety Supervision and the State Administration of Safety in Production Supervision were established to oversee the country's coal mine production safety. The Government intensified its efforts to enforce coal mine safety regulations by closing down coal mines for safety violations. As the country became more industrialized, energy demand increased. In China, demand for electricity exceeded supply. Coal was the major energy source in China even though alternative indigenous fuel sources were being increasingly exploited. To meet the need, many coal mines produced much more than their designed capacities. Because the mines were employment sites and sources of revenue, local governments ignored overproduction and safety lapses. More than 6,000 coal miners died yearly. Most of these accidents were at county-level coal mines. Some local officials and their relatives even have personal stakes in coal mines. Many mines should not have received operation licenses but did because of the conflict of interest between ownership and enforcement of the local government regulations (Interfax Information Services, 2004c; Financial Times, 2005; Washington Post, 2005).

With the Government's approval, China Shenhua Energy Corp. [a subsidiary of the state-owned Shenhua Group (Shenhua Coal Corp.)] planned to issue 3.06 billion shares of stock at prices between $0.93 and $1.18 on the Hong Kong Stock Exchange in 2005. Anglo American planned to buy $150 million worth of shares in Shenhua's initial public offering. Besides Anglo American, Shenhua also signed agreements with another six investors for buying shares. About 92.5% of the listed shares will be offered to multinational companies, and the remaining will be offered to subscribers in Hong Kong. In an effort to improve coal transportation, Shenhua and the Tianjin Port Group agreed to build a $440 million coal port at the Nanjiang Harbor in Tianjin City. The port will have one 150,000-dwt berth and two 70,000-dwt berths and was scheduled to be completed in 2006. The port was expected to handle 30 Mt/yr of coal in 2008. Shenhua also built a 67-km railway to link Huanghua, Hebei Province, with the Port of Wanjia in Tianjin City. After completion the berth, Shenhua will have a maximum loading capacity of 45 Mt/yr in Tianjin City. Shenhua and Dow Chemical Corp. of the United States planned a joint evaluation of the feasibility of coal-to-olefins projects at Yulin, Shaanxi Province (Chemical and Engineering News, 2005; Interfax Information Service, 2005a).

The Government planned to establish 13 large-scale coal regions, which included more than 40 coal bases that have total coal reserves of more than 700 billion metric tons. The intention for the establishment of these regions was to match coal resources with the development of the chemical, metallurgical, and power sectors. The first 19 of the coal bases were announced in September and are located in the Provinces of Shaanxi and Shanxi and the Nei Mongol Autonomous Region. In 2004, the production capacity of these 13 coal regions accounted for 50% of the total output and was expected to increase to 70% in 2010 (Ministry of Land and Resources, 2004).

Shanxi Province accounted for more than 20% of the country's total coal output, but powerplants in the Province experienced shortages of steam coal. Because of transportation bottlenecks, coal from mines could not be shipped to the powerplants. Construction of railways lagged behind other developments. Also, the coal-power pricing system contributed to the shortage of steam coal at powerplants. The Government allowed coal producers to sell their products at market prices in the 1990s; the price of steam coal for powerplants, however, was negotiated between coal producers and powerplant operators yearly under Government guidelines, which were known as "planned coal." The Government decided electricity prices. Although powerplants were supposed to be able secure the volume of coal at preferential prices, coal producers were reluctant to sell their coal below the market price. When the demand for coal was high and the coal price was high in international and domestic markets, coal producers preferred to sell to other domestic buyers or to export their coal. During the past 2 years, powerplant operators had difficulty in securing sufficient coal to meet their needs (Coal Industry News, 2004).

Natural Gas and Petroleum.—Because of rapid economic growth, China depended on oil imports to balance supply and demand even though oil output increased in the past several years. Imported crude oil accounted for more than one-third of the total supply. In an effort to facilitate oil imports, China National Petroleum Corp. signed agreements with Kazakhstan and Russia to finance pipelines and to expand shipping capacity from these countries to China. About 90% of Chinese oil output came from onshore wells. Daqing Oilfield in Heilongjiang Province was the leading producer, but oil output from Daqing has declined in the past 2 years. Oil output from the Xinjiang Uygur Autonomous Region was expected to increase in the future. China's oil output was expected to increase to 200 Mt in 2010 (Interfax Information Services, 2005b).

Chinese scholars asked the Government to consider building a pipeline from Burma to China. China's oil imports were mainly from Africa and the Middle East. The Strait of Malacca has become one of the most pirate-infested waterways in the world. The proposed pipeline will reduce the sea journey by about 3,000 km compared with the Malacca route. China was Singapore's leading oil trade partner in Asia and the Pacific region. The change of shipping route will affect trade partnerships with Singapore and other Southeast Asian countries. Another challenge for a proposed pipeline is to pass through Yunnan Province, which is located in the southwestern part of the country, to the eastern and southeastern consuming centers. Because the Province lacks oil infrastructure, the investment will need to be large to build refineries in the area or to lay down more pipelines to ship oil to consuming areas (Interfax Information Services, 2004e).

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China Geological Survey
37 Guanyingyuan Xiqu Xichang
District Beijing 100035, China
China Iron and Steel Association
46 Dongsi Xi Dajie Dongcheng District
Beijing 100711, China
China National Offshore Oil Corp.
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12B Fuxing Lu Xicheng
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China Non-metallic Minerals Industry Corp.
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Beijing 100831, China
China Petrochemical Corp.
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38 Yuetannanjie Xicheng District
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TABLE 1
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
METALS						
Aluminum:						
Bauxite, gross weight	thousand metric tons	9,000	9,800	11,000	13,000	15,000
Alumina	do.	4,330	4,650	5,450	6,110	6,990
Metal, refined, primary and secondary	do.	2,990	3,570	4,510	5,970	6,900
Antimony:						
Mine, Sb content		110,000	140,000	100,000	100,000	110,000
Metal		106,000	148,000	124,000	90,000	125,000
Bismuth:						
Mine output, Bi content		2,000 [r]	2,000 [r]	2,000 [r]	2,000 [r]	2,000
Metal		2,000 [r]	2,000 [r]	2,000 [r]	2,500 [r]	2,500
Cadmium, smelter		2,370	2,510	2,440	2,700 [r]	2,800
Chromite, gross weight	thousand metric tons	208	182	180	200	200
Cobalt:						
Mine output, Co content		90	150	1,000	700	800
Metal		410	680	980	990	1,200
Copper:						
Mine output, Cu content		593,000	587,000	568,000	610,000	610,000
Metal:						
Smelter, primary	thousand metric tons	1,020	1,150	1,180	1,380	1,400
Refined:						
Primary	do.	1,020	1,220	1,300	1,420	1,630
Secondary	do.	350	300	350	430	520
Total	do.	1,370	1,520	1,650	1,850	2,150
Gold, mine output, Au content		180	185	192	205	215
Indium		200	190 [r]	160 [r]	180 [r]	200
Iron and steel:						
Iron ore, gross weight	thousand metric tons	223,000	220,000	231,000	261,000	310,000
Pig iron	do.	131,010 [4]	155,540 [4]	170,850 [4]	213,670 [4]	251,850 [4]
Ferroalloys	do.	4,030	4,500	4,840	6,340	8,670
Steel, crude	do.	128,500 [4]	151,630 [4]	182,370 [4]	222,340 [4]	272,800 [4]
Steel, rolled	do.	131,460 [4]	160,680 [4]	192,520 [4]	241,080 [4]	297,230 [4]
Lead:						
Mine output, Pb content		660,000	676,000	641,000	955,000	950,000
Metal:						
Smelter, primary		830,000	840,000	916,000	1,250,000	1,400,000
Refined:						
Primary		998,000	984,000	1,100,000	1,290,000	1,500,000
Secondary		102,000	211,000	230,000	290,000	350,000
Total		1,100,000	1,200,000	1,330,000	1,580,000	1,850,000
Magnesium metal and alloy		190,000	200,000	230,000	342,000	426,000
Manganese:						
Ore, Mn content	thousand metric tons	700	860	900	920	900
Metal		120,000	150,000	190,000	320,000	350,000
Mercury, mine output, Hg content		200	190	495	610	425
Molybdenum, mine output, Mo content		28,800	28,200	29,300	31,000	29,000
Nickel:						
Mine output, Ni content		50,300	51,500	53,700	61,000	64,000
Matte		57,000	59,000	59,200	69,300 [r]	70,000
Smelter		50,900	49,500	52,400	64,700	72,000
Silicon, metal		480,000	500,000	580,000	680,000	700,000
Silver, mine output, Ag content		1,600	1,910	2,200	2,400	2,450
Tin:						
Mine output, Sn content		99,400	95,000	62,000	102,000	110,000
Metal		112,000	105,000	82,000	98,000	115,000

See footnotes at end of table.

TABLE 1--Continued
CHINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
METALS--Continued						
Titanium:						
Ilmenite, TiO_2 equivalent		125,000	150,000	375,000	400,000	420,000
Sponge		1,900	2,470	3,650	4,120	5,000
Tungsten, mine output, W content		37,000	42,100 [r]	55,100 [r]	55,500 [r]	67,000
Vanadium, in vanadiferrous slag product		30,000	30,000	33,000	35,000	40,000
Zinc:						
Mine output, Zn content	thousand metric tons	1,780	1,700	1,550	2,030	2,100
Refined, primary and secondary	do.	1,980	2,040	2,100	2,320	2,500
INDUSTRIAL MINERALS						
Asbestos		315,000	310,000	562,000 [r]	500,000 [r]	510,000
Barite	thousand metric tons	3,500	3,600	3,100	3,600 [r]	3,900
Boron, mine, B_2O_3 equivalent		145,000	150,000	145,000	130,000	135,000
Bromine		42,000	40,000	42,000	42,000	4,300
Cement, hydraulic	thousand metric tons	597,000 [4]	661,040 [4]	725,000 [4]	862,080 [4]	970,000 [4]
Diatomite		350,000	350,000	370,000	380,000	390,000
Dolomite	thousand metric tons	6,700	6,700	7,000	7,300	7,500
Fluorspar	do.	2,450	2,450	2,450	2,650	2,700
Graphite		430,000	450,000	629,000	710,000	700,000
Gypsum	thousand metric tons	6,800	6,800	6,850	6,850	7,000
Kaolin	do.	3,250 [r]	3,500 [r]	3,600 [r]	3,700 [r]	3,750
Lithium minerals, all types		16,000	16,000	16,000	17,000	18,000
Magnesite	thousand metric tons	4,070	3,580	4,560 [r]	4,600 [r]	4,650
Nitrogen, N content of ammonia	do.	27,700 [4]	28,200 [4]	30,300 [4]	31,500 [4]	34,770 [4]
Phosphate rock, P_2O_5 equivalent	do.	5,820	6,300	6,900	7,550	7,650
Potash, marketable, potassium oxide equivalent	do.	380	385	450	500	550
Rare earths, rare-earth oxide equivalent		73,000	81,000	88,000	92,000	98,000
Salt	thousand metric tons	31,280 [4]	34,105 [4]	36,024 [4]	34,377 [4]	37,100 [4]
Sodium compounds:						
Mirabilite	do.	2,900	4,200	5,000	5,800	6,300
Soda ash, natural and synthetic	do.	8,342 [4]	9,144 [4]	10,330 [4]	11,336 [4]	13,024 [4]
Sulfur:						
Native	do.	290	290	290	290	300
Content of pyrite	do.	3,370	3,090	3,240	3,400	3,730
Byproduct, all sources	do.	1,900	2,000	2,200	2,400	2,600
Total	do.	5,560	5,380	5,730	6,090	6,630
Talc and related materials	do.	3,500	3,500	2,500	3,000 [r]	3,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	do.	176,000	190,000	250,000	218,000	220,000
Bituminous	do.	781,000	965,000	1,110,000	1,470,000	1,690,000
Lignite	do.	42,000	47,800	53,000	52,000	50,000
Total	do.	999,000	1,200,000	1,410,000	1,740,000	1,960,000
Coke, all types	do.	121,840 [4]	131,310 [4]	142,800 [4]	138,800 [4]	177,480 [4]
Gas, natural:						
Gross	billion cubic meters	27	30	33	35	41
Marketed	do.	22	24	26	28	34
Petroleum:						
Crude, including crude from oil shale	million 42-gallon barrels	1,200	1,210	1,240	1,260	1,300
Refinery products	do.	1,470	1,460	1,530	1,600	1,650

[r] Revised.

[1] Table includes data available through August 30, 2005.

[2] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[3] The country also produces diamond, gallium, germanium, platinum-group metals, and uranium; no reliable basis, however, is available for the estimation of output levels.

[4] Reported by China's State Statistical Bureau.

TABLE 2
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities	Annual capacity[e]
Aluminum:			
Alumina	Pingguo Aluminum Co. (Aluminum Corporation of China)	Guangxi, Pingguo	1,200
Do.	Guizhou Aluminum Plant (Aluminum Corporation of China)	Guizhou, Guiyang	1,200
Do.	Zhengzhou Aluminum Plant (Aluminum Corporation of China)	Henan, Zhengzhou	2,000
Do.	Zhongzhou Aluminum Plant (Aluminum Corporation of China)	Hunan, Zhongzhou	1,100
Do.	Shandong Aluminum Plant (Aluminum Corporation of China)	Shandong, Zibo	1,500
Do.	Shanxi Aluminum Plant (Aluminum Corporation of China)	Shanxi, Hejin	2,200
Metal	Baiyin Aluminum Plant	Gansu, Baiyin	150
Do.	East Hope Aluminum Plant	Gansu, Baotou	500
Do.	Lanzhou Aluminum Plant	Gansu, Lanzhou	210
Do.	Liancheng Aluminum Plant	do.	235
Do.	Pingguo Aluminum Co. (Aluminum Corporation of China)	Guangxi, Pingguo	380
Do.	Guizhou Aluminum Plant (Aluminum Corporation of China)	Guizhou, Guiyang	400
Do.	Jiaozuo Wanfang Aluminum Co. Ltd.	Henan, Jiaozuo	300
Do.	Henan Wanji Aluminum Co. Ltd.	Henan, Luoyang	180
Do.	Henan Huanghe Mianchi Aluminum Plant	Henan, Mianchi	115
Do.	Sanmenxia Tianyuan Aluminum Co. Ltd.	Henan, Sanmenxia	110
Do.	Shangqiu Aluminum Smelter	Henan, Shangqiu	115
Do.	Yichuan Yugang Longquan Aluminum Co.	Henan, Yichuan	400
Do.	Henan Shenhuo Aluminum-Electricity Co. Ltd.	Henan, Yongcheng	200
Do.	Hanjiang Danjiangkou Aluminum Co. Ltd.	Hubei, Danjiangkou	73
Do.	Zhengzhou Aluminum Plant (Aluminum Corporation of China)	Hunan, Zhengzhou	60
Do.	Jilin Aluminum Co.	Jilin, Panzhi	70
Do.	Fushun Aluminum Plant	Liaoning, Fushun	175
Do.	Baotou Aluminum Plant	Nei Mongol, Baotou	216
Do.	Qingtongxia Aluminum Plant	Ningxia, Qingtongxia	400
Do.	Qinghai Aluminum Smelter (Aluminum Corporation of China)	Qinghai, Xining	360
Do.	Tongchuan Xingguang Aluminum Co. Ltd.	Shaanxi, Tongchuan	80
Do.	Huaxin Aluminum Industry Co.	Shandong, Chiping	160
Do.	Taishan Aluminum-Power Co. Ltd.	Shandong, Fecheng	125
Do.	Shandong Aluminum Plant (Aluminum Corporation of China)	Shandong, Zibo	55
Do.	Taiyuan Oriental Aluminum Co.	Shanxi, Taiyuan	75
Do.	Shanxi Guanlu Aluminum Co. Ltd.	Shanxi, Yuncheng	210
Do.	Yunnan Aluminum Plant	Yunnan, Kunming	300
Antimony	Huaxi (China Tin) Group Industrial Co.	Guangxi, Hechi	25
Do.	Xikuangshan Twinkling Star Co. Ltd.	Hunan, Lengshuijiang	37
Asbestos	China National Nonmetallic Industry Corp.	Nei Mongol, Baotou; Shanxi, Lai Yuan and Lu Liang	130
Barite	do.	Guizhou, Xiangshou	NA
Bisumth metric tons	Guangzhou Smelter	Guangdong,Guangzhou	300
Do. do.	Shizhuyuan Nonferrous Metals Co. Ltd.	Hunan, Shizhuyuan	1,000
Do. do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	350
Do. do.	Yunnan Copper Group Co. Ltd.	Nei Mongol, Chifeng	300
Cadmium	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	1
Coal	Hebei Provincial Government	Hebei	70,000
Do.	Heilongjiang Provincial Government	Heilongjiang	100,000
Do.	Henan Provincial Government	Henan	100,000
Do.	Liaoning Provincial Government	Liaoning	70,000
Do.	Nei Mongol Provincial Government	Nei Mongol	90,000
Do.	Shandong Provincial Government	Shandong	60,000
Do.	Shanxi Provincial Government	Shanxi	400,000
Do.	Sichuan Provincial Government	Sichuan	80,000
Do.	Shenhua Coal Corp.	Ningxia, Nei Mongol, and Shaanx	150,000
Cobalt metric tons	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchang	1,200

See footnotes at end of table.

TABLE 2--Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities	Annual capacity[e]
Copper, refined		Jinchang Smelter (Tongling Nonferrous Metals Co.)	Anhui, Tongling	130
Do.		Jinlong Smelter (Tongling Nonferrous Metals Co.)	do.	120
Do.		Wuhu Smelter (Hengxin Copper Industry Group Co.)	Anhui, Wuhu	60
Do.		Baiyin Nonferrous Metals Co.	Gansu, Baiyin	50
Do.		Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	120
Do.		Luoyang Copper Processing Factory	Henan, Luoyang	50
Do.		Daye Nonferrous Metals Co.	Hubei, Daye	160
Do.		Zhangjiagang United Copper Co. (Tongling Nonferrous Metals Co.)	Jiangsu, Zhangjiagang	100
Do.		Guixi Smelter (Jiangxi Copper Co. Ltd.)	Jiangxi, Guixi	400
Do.		Huludao Copper Smelter (Huludao Zinc Smelting Co.)	Liaoning, Huludao	100
Do.		Shandong Jinsheng Nonferrous Metals Corp.	Shandong, Linyi	100
Do.		Taiyuan Copper Industry Co.	Shanxi, Taiyuan	30
Do.		Zhongtiaoshan Nonferrous Metals Co.	Shanxi, Yuangu	80
Do.		Tianjin Copper Electrolysis Factory	Tianjin	25
Do.		Yunnan Smelter (Yunnan Copper Group Co. Ltd.)	Yunnan, Kunming	250
Gas, natural	billion cubic meters	China National Petroleum Corp.	Sichuan	10
Gold, refined	metric tons	China National Gold Corp.	Henan, Lingbao	10
Do.	do.	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	12
Do.	do.	Laizhou Gold Co.	Shandong, Laizhou	15
Do.	do.	Zhaoyuan Gold Co.	Shandong, Zhaoyuan	15
Do.	do.	Great Wall Gold Silver Refinery	Sichuan, Chengdu	100
Graphite		Jixi Aoyu Graphite Co. Ltd.	Heilongjiang, Jixi and Luo	60
Do.		Nei Mongol Xinghe Jingxin Graphite Co. Ltd.	Nei Mongol, Xinghe	10
Indium	metric tons	Laibin Smelter [Liuzhou Huaxi (China Tin) Group Co.]	Guangxi, Laibin	60
Do.	do.	Liuzhou Zinc Products Co.	Guangxi, Liuzhou	20
Do.	do.	Zhuzhou Smelter	Hunan, Zhuzhou	60
Do.	do.	Huludao Nonferrous Metals Group Co.	Liaoning, Huludao	30
Iron and steel:				
Iron ore		Maanshan Iron and Steel Co.	Anhui, Maanshan	10,000
Do.		Shoudu (Capital) Mining Co.	Beijing	20,000
Do.		Meishan Metallurgical Co.	Shanghai	2,000
Do.		Jiuquan Iron and Steel Co.	Gansu, Jiayuguan	4,000
Do.		Hainan Iron Mine	Hainan, Changjiang	4,600
Do.		Handan Xingtai Metallurgical Bureau	Hebei, Handan	3,800
Do.		Tangshan Iron and Steel Co.	Hebei, Tangshan	3,000
Do.		Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	5,100
Do.		Banshigou Iron Mine Mining Co.	Jilin, Hunjiang	1,400
Do.		Anshan Mining Co.	Liaoning, Anshan	30,000
Do.		Benxi Iron and Steel Co.	Liaoning, Benxi	13,700
Do.		Baotou Iron and Steel and Rare Earth Co.	Nei Mongol, Baotou	10,000
Do.		Taiyuan Iron and Steel Co.	Shanxi, Taiyuan	4,000
Do.		Dabaoshan Mining Co.	Guangdong, Qujiang	1,670
Do.		Panzhihua Mining Co.	Sichuan, Panzhihua	13,000
Do.		Kunming Iron and Steel Co.	Yunnan, Kunming	1,400
Ferroalloys		Shoudu (Capital) Iron and Steel (Group) Co.	Beijing	35
Do.		Northwest Ferroalloy Co.	Gansu, Yongdeng	60
Do.		Zunyi Ferroalloy Co.	Guizhou, Zunhi	100
Do.		Jilin Ferroalloy Co.	Jilin, Jilin	250
Do.		Jinzhou Ferroalloy Co.	Liaoning, Jinzhou	90
Do.		Liaoyang Ferroalloy Co.	Liaoning, Liaoyang	70
Do.		Shanghai Iron and Steel Co. Ltd.	Shanghai	180
Do.		Emei Ferroalloy Co.	Sichuan, Emei	70
Do.		Hengshan Ferroalloy Co.	Zhejiang, Jiande	70

See footnotes at end of table.

TABLE 2--Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies[1]	Location of main facilities	Annual capacity[e]
Iron and steel--Continued:			
Steel, crude	Ma'anshan Iron and Steel Co.	Anhui, Maanshan	3,000
Do.	Shoudu (Capital) Iron and Steel (Group) Co. (Shougang)	Beijing	8,500
Do.	Liuzhou Iron and Steel Group	Guangxi, Liuzhou	6,000
Do.	Handan Iron and Steel General Work (Handan)	Hebei, Handan	2,400
Do.	Tangshan Iron and Steel Co. (Taigang)	Hebei, Tangshan	2,300
Do.	Wuhan Iron and Steel (Group) Co. (Wugang)	Hubei, Wuhan	12,000
Do.	Shagang Group Co. Ltd.	Jiangsu, Zhangjiagang	13,000
Do.	Anshan Iron and Steel (Group) Co. (Angang)	Liaoning, Anshan	11,000
Do.	Benxi Iron and Steel Co. (Bengang)	Liaoning, Benxi	2,700
Do.	Baotou Iron and Steel and Rare Earth Co.	Nei Mongol, Baotou	7,000
Do.	Baoshan Iron and Steel (Group) Corp. (Baosteel)	Shanghai	19,000
Do.	Shanghai Iron and Steel Co. Ltd.	do.	6,000
Do.	Taiyuan Iron and Steel Co. (Taigang)	Shanxi, Taiyuan	2,500
Do.	Panzhihua Iron and Steel (Group) Co. (Pangang)	Sichuan, Panzhihua	3,000
Lead	Baiyin Nonferrous Metals Co. Ltd.	Gansu, Baiyin	50
Do.	Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	100
Do.	Anyang Smelter (Yubei Metal Co.)	Henan, Anyang	150
Do.	Jiyuan Wangyang Nonferrous Smelter	Henan, Jiaozuo	45
Do.	Jiyuan Smelter (Yuguang Gold-Lead Co. Ltd.)	Henan, Jiyuan	200
Do.	Henan Lingye Co. Ltd.	Henan, Lingbao	100
Do.	Hanjiang Smelter	Hubei, Luhekou	50
Do.	Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyang	80
Do.	Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	100
Do.	Kunming Smelter	Yunnan, Kunming	100
Lithium, $LiCO_3$	Sichuan Shehong Lithium Co. Ltd.	Sichuan, Shehong	2
Do.	Xinjiang Lithium Co.	Xinjiang, Urumqi	5
Magnesium	Fushun Aluminum Plant	Liaoning, Fushun	5
Do.	Ningxia Huayuan Magnesium Group	Ningxia, Yinchuan	15
Do.	Huayu Interprises (Group) Ltd.	Shanxi, Jishan	35
Do.	Taiyuan Tongxiang Magnesium Metal Co. Ltd.	Shanxi, Taiyuan	45
Do.	Taiyuan Yiwei Magnesium Co. Ltd.	Do.	21
Do.	Wenxi Biyun Magnesium Co. Ltd.	Shanxi, Wenxi	30
Do.	Wenxi Yinguang Magnesium Group	Do.	40
Do.	Minhe Magnesium Plant	Qinghai, Minhe	7
Manganese, metal	Chongqing Tycoon Manganese Co. Ltd.	Chongqing	23
Do.	Guangxi Dameng Manganese Industry Co. Ltd.	Guangxi, Nanning	70
Molybdenum, concentrate	Luoyang Luanchuan Molybdenum Industry Group Co., Ltd.	Henan, Luanchuan	13
Do.	Jinduichang Mining Corp.	Shaanxi, Huaxian	9
Nickel, refined	Jinchuan Nonferrous Metals Corp.	Gansu, Jinchuan	100
Do.	Chengdu Electro-Metallurgy Factory	Sichuan, Chengdu	5
Petroleum, crude	Shengli Bureau	Hebei, Shengli	33,500
Do.	Daqing Bureau	Heilongjiang, Daqing	55,000
Do.	Liaohe Bureau	Liaoning, Liaohe	15,000
Do.	Bohai Offshore Oil Corp.	Bohai	4,000
Do.	Nanhai East Corp.	Nanhai	5,000
Potash	Qinghai Yanhu Industry Group Co. Ltd.	Qinghai	40
Rare earths	Gansu Rare Earths Co.	Gansu, Baiyin	32
Do.	Jiangxi Rare Earths Co.	Jiangxi, Nanchang	1
Do.	Zhujiang Smelter	Guangdong, Guangzhou	5
Do.	Baotou Iron and Steel and Rare Earths Corp.	Nei Mongol, Baotou	25
Do.	Shanghai Yaolong Nonferrous Metals Co.	Shanghai	2
Salt	Shandong Haihua Group Co. Ltd.	Shandong, Weifang	1,400
Do.	Zigong Zhangjiaba Salt Chemical Plant	Sichuan, Zigong	250

See footnotes at end of table.

TABLE 2--Continued
CHINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies[1]	Location of main facilities	Annual capacity[e]
Silver	metric tons	Daye Nonferrous Metals Co.	Hubei, Daye	100
Do.	do.	Jiangxi Copper Co. Ltd.	Jiangxi, Guixi	400
Do.	do.	Great Wall Gold Silver Refinery	Sichuan, Chengdu	300
Talc		China National Nonmetallic Industry Corp.	Guangxi, Longshen	130
Do.		do.	Liaoning, Haicheng	50
Do.		do.	Shandong, Qixia	5
Tin, smelter		Laibin Smelter [Huaxi (China Tin) Group Co.]	Guangxi, Laibin	25
Do.		Pinggui Mining Bureau	Guangxi, Zhongshan	8
Do.		Yunnan Tin Industry Co.	Yunnan, Gejiu	55
Titanium, sponge		Zunyi Titanium Plant	Guizhou, Zunyi	6
Do.		Fushun Aluminum Plant	Liaoning, Fushun	1
Tungsten, concentrate		Shizhuyuan Nonferrous Metals Co.	Hunan, Chenzhou	5
Do.		Yaogangxian Tungsten Mine	Hunan, Yizhang	3
Do.		Nanchang Co.	Jiangxi, Nanchang	15
Zinc		Northwest China Lead-Zinc Smelter (Baiyin Nonferrous Metals Co. Ltd.)	Gansu, Baiyin	150
Do.		Shaoguan Smelter (Shenzhen Nonfemet Co.)	Guangdong, Shaoquan	170
Do.		Liuzhou Zinc Products Factory	Guangxi, Liuzhou	100
Do.		Shuikoushan Nonferrous Metals Co. Ltd.	Hunan, Hengyan	60
Do.		Zhuzhou Smelter (Zhuye Torch Metals Co. Ltd.)	Hunan, Zhuzhou	300
Do.		Huludao Zinc Smelting Co.	Liaoning, Huludao	330
Do.		Laibin Smelter	Yunnan, Laibin	60
Do.		Yunnan Jinding Zinc Co. Ltd. (Sichuan Hongda Group)	Yunnan, Lanping	100

[e] Estimated; estimated data are rounded to no more than three significant digits. NA Not available.

[1] Companies are owned by either a State Government or a Provincial Government.

TABLE 3

CHINA: EXPORTS OF SELECTED MINERAL COMMODITIES IN 2004

Commodity	Quantity (metric tons)	Value (thousands)
METALS		
Aluminum:		
Alumina	20,000	$11,010
Metal and alloys:		
Unwrought	1,684,386	2,800,786
Semimanufactures	430,988	1,120,094
Antimony metal, unwrought	21,490	48,958
Barium sulfate	2,390,000	77,818
Bismuth, includes powder, unwrought, and waste	4,626	25,782
Copper, metal and alloys:		
Unwrought	126,276	345,094
Semimanufactures	390,023	1,496,828
Iron and steel:		
Ferrosilicon	930,000	675,657
Pig iron and cast iron	1,290,000	361,443
Steel:		
Bars and rods	4,470,000	1,948,333
Shapes and sections	540,000	273,818
Sheets and plates	5,780,000	3,346,013
Tube and pipe	700,000	842,921
Magnesium metal, unwrought	269,802	397,126
Manganese, unwrought	269,802	397,126
Tin, metal and alloys, unwrought	38,915	321,055
Tungsten, tungstates	5,909	38,531
Zinc:		
Metal and alloys, unwrought	263,149	269,113
Oxide and peroxide	67,063	60,283
INDUSTRIAL MINERALS		
Cement	7,040,000	230,394
Fluorspar	830,000	119,164
Granite	4,694,224	1,071,665
Graphite, natural	451,735	67,041
Magnesia, fused	392,736	110,202
Talc	640,000	65,954
MINERAL FUELS AND RELATED MATERIALS		
Coal	86,660,000	3,811,241
Coke, semicoke	15,010,000	3,948,769
Petroleum:		
Crude oil	5,490,000	1,324,692
Refinery products	11,460,000	3,960,202

Source: General Administration of Customs of the People's Republic of China, 2004, China monthly exports and imports, no. 12.

TABLE 4
CHINA: IMPORTS OF SELECTED MINERAL COMMODITIES IN 2004

(Metric tons unless otherwise specified)

Commodity		Quantity	Value (thousands)
METALS			
Aluminum:			
Alumina		5,870,000	$2,043,563
Metal and alloys, unwrought		1,033,422	1,570,880
Semimanufactures		610,636	1,944,157
Scrap		1,200,008	1,074,771
Chromium, chromite		2,170,000	381,310
Copper:			
Ore and concentrates		2,880,000	2,238,422
Metal and alloys, unwrought		1,381,112	3,812,545
Semimanufactures		1,195,365	3,914,718
Scrap		3,957,604	2,454,969
Iron and steel:			
Iron ore		208,090,000	12,711,952
Steel:			
Bars and rods		1,380,000	922,021
Scrap		10,230,000	2,231,682
Seamless pipe		1,320,000	1,586,354
Shapes and sections		810,000	356,278
Sheets and plates		25,100,000	17,185,992
Manganese ore		4,650,000	585,646
Titanium dioxide		250,989	435,143
INDUSTRIAL MINERALS			
Diamond	kilograms	15,268	1,662,353
Fertilizers:			
Compound fertilizers		4,370,000	992,572
Diammonium phosphate		2,290,000	575,654
Potassium chloride		7,180,000	1,158,800
Potassium sulfate		170,000	30,028
Urea		40,000	5,487
Sodium carbonate		197,174	22,746
MINERAL FUELS AND RELATED MATERIALS			
Coal		18,610,000	886,723
Petroleum:			
Crude oil		122,720,000	33,912,468
Refinery products		37,880,000	9,248,352

Source: General Administration of Customs of the People's Republic of China, 2004, China monthly exports and imports, no. 12.

THE MINERAL INDUSTRY OF FIJI

By Travis Q. Lyday

The Republic of the Fiji Islands is an archipelago comprising 322 islands, of which only about 100 are inhabited. The islands, which are located in the southwestern Pacific Ocean about 3,000 kilometers (km) northeast of Sydney, Australia, consist of 18,376 square kilometers of land area. The four main islands of Fiji are, by size, Viti Levu, where the capital city of Suva is located, Vanua Levu, Taveuni, and Kandavu. The population of about 881,000 included indigenous Fijians (approximately 54%) and Indo-Fijians (40%) (U.S. Department of State, 2005§[1]).

The economy was largely based on agriculture, fishing, forestry, garment manufacturing, mining, and tourism. Fiji's gross domestic product (GDP) based on purchasing power parity was about $5.1 billion and represented a per capita income of $5,997. The country's real GDP grew by 4.1% in 2004 (International Monetary Fund, 2005§).

Fiji's mining industry was centered on gold, which was produced only by the Sydney, Australia-based owner and operator Emperor Mines Ltd. at its Vatukoula Mine. The Vatukoula Mine, which is often referred to as the Emperor Mine, is located on Viti Levu Island approximately 380 km by road from the port city of Suva. Silver was recovered as a byproduct of gold production.

Fiji imported significant amounts of building stone, lime, and marble, although domestic deposits (some of which had small production for local use) were known. Other Fijian mineral resources include bauxite, copper, lead, mineral sands, and zinc deposits.

More-extensive coverage of the mineral industry of Fiji can be found in the 2003 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Asia and the Pacific.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

TABLE 1

FIJI: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

Commodity[3]		2000	2001	2002	2003	2004
Cement, hydraulic	metric tons	95,000	95,000	100,000	100,000	100,100
Gold, mine output, Au content	kilograms	3,840	3,836 [4]	3,731 [4]	3,250	3,800
Silver, mine output, Ag content	do.	1,480	1,974 [4]	1,901 [4]	1,500	1,500

[1] Estimated data are rounded to no more than three significant digits.

[2] Table includes data available through December 2005.

[3] In addition to the commodities listed, crushed and dimension stone, sand and gravel, and sand for cement manufacture are produced, but data are insufficient to make reliable estimates of quantities.

[4] Reported figure.

THE MINERAL INDUSTRY OF INDIA

By Chin S. Kuo

India was one of Asia's best-performing economies. In 2004, India's gross domestic product (GDP) grew by 6.5%. The poor monsoon rains in July, however, led to an average crop yield, which was unable to boost incomes in the countryside. Agriculture accounted for 22% of the GDP and sustained nearly 60% of the total population. Industrial production staged a turnaround and the services sector was going strong; together, these sectors accounted for 75% of the GDP. Inflation rose sharply in response to rising global oil prices. Exploration and mine development were open to private sector and foreign company investment (Far Eastern Economic Review, 2004).

India has significant mineral resources and produced several metals, many industrial minerals, and a few mineral fuels (table 1). The mineral industry was characterized by a large number of small-scale operations. Large state-owned companies operated most of the coal and metal mines. The country was ranked first in world output of mica and third in the production of barite, chromite, coal, kyanite and sillimanite, and talc and pyrophyllite.

Government Policies and Programs

As the process of privatizing the mining sector moved forward, the Government encouraged greater private sector participation in the exploration for and exploitation of minerals. The policy changes attracted many multinational companies to invest in exploration for base metals and other minerals. As of December, 73 proposals involving foreign direct investment worth $900 million and reconnaissance permits involving an area of 238,000 square kilometers (km^2) were approved. The Government abolished foreign investment limits on private oil exploration and marketing companies. A planned privatization of India's large oil companies was shelved by the Government.

Commodity Review

Metals

Aluminum.—Utkal Alumina International Ltd.'s $1 billion alumina project was delayed following local protests. The State government of Orissa allotted 3,000 hectares of land to the company and seemed reluctant to rush the relocation of about 140 families from the site. The project was 5 years behind its original schedule. The company was 55% owned by Hindalco Industries Ltd., and Alcan Aluminium Ltd. of Canada held the remainder. The alumina refinery would initially produce 1.5 million metric tons per year (Mt/yr) of alumina (Metal-Pages, 2004c§[1]).

Sterlite Industries Ltd. planned to invest $2 billion during the next 3 years to expand current operations. The expansion plan included an alumina refinery project in Orissa, Bharat Aluminium Co. Ltd., and Hindustan Zinc Ltd. National Aluminium Co. Ltd. invited applications from contractors and suppliers for the expansion of its alumina refinery and smelter in Orissa. The company planned to increase production capacity for bauxite to 6.3 Mt/yr from 4.8 Mt/yr; alumina, to 2.1 Mt/yr from 1.58 Mt/yr; and aluminum, to 460,000 metric tons per year (t/yr) from 345,000 t/yr (Mining Journal, 2004b).

Vedanta Resources plc started construction of a new $1.9 billion alumina refinery in Orissa to produce 1.4 Mt/yr of alumina in 2007. Some of the plant's output would be used by Bharat Aluminium, and the remainder was to be sold in the Indian market. Vedanta also was considering the possibility of building an aluminum smelter in Orissa. Having received the mining lease from the State government, the company was awaiting environmental approvals for bauxite mining from the Federal Government (Mining Journal, 2004c).

Copper.—The wholly owned subsidiary of Pebble Creek Resources Ltd. of Canada in India, Adi Gold Mining Private Ltd., owned 100% interest in a prospecting license of 7.9 km^2 that covered the Askot deposit near Almora in Uttaranchal. The deposit was a high-grade massive sulfide mineralization of copper, gold, lead, silver, and zinc. The company's 60-km^2 Gadarwara property in the Narsinghpur District in Madhya Pradesh showed geophysical anomalies that might indicate a copper and gold deposit of the Olympic Dam type or a nickel and platinum-group metals deposit of the Norilsk type (Pebble Creek Resources Ltd., 2004).

Indian copper smelters faced a difficult time owing to tight supplies of copper concentrate imported from Australia and South America. Shortages forced the copper producers to cut inventories and pay higher prices for copper concentrate. India imported 1.35 Mt/yr of copper concentrate and produced about 100,000 t/yr of its own, which was used to make 400,000 t/yr of copper cathode. Copper production was expected to increase by 100,000 t/yr as a result of capacity expansions of Hindalco Industries and Sterlite Industries (Reuters, 2004a).

Sterlite Industries received 22% of its copper concentrate requirements from Australia. The company operated a 180,000-t/yr smelter at Tuticorin in southern India, a 180,000-t/yr refinery at Silvassa in western India, and two copper-rod plants with a combined capacity of 140,000 t/yr.

Hindustan Copper Co. Ltd. (HCL) reopened its Ghatsila copper smelter in June as rising global copper prices boosted the metal's prospects. The 16,500-t/yr smelter in Jharkland had been shut down for care and maintenance in July 2003. The company planned to shut down its 45,000-t/yr-capacity Khetri copper smelter in Rajasthan for annual maintenance. HCL was 98.95% owned by the Government (Reuters, 2004b).

SWIL Limited was to gradually increase production at its new plant in Gujarat after a 6-year delay. The plant operated at about 60% of its installed capacity in July. When the plant reaches its full capacity of 70,000 t/yr, SWIL will become India's third ranked copper producer (Metal Bulletin, 2004e).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Gold.—Deccan Gold Mines discovered another gold-bearing deposit in the Haveri zone after its successful find at the Dharwar Shimoga belt. The 470-by-27 meter (m) zone at Ganajur could potentially yield 2 metric tons (t) of gold. The discovery was the outcome of reconnaissance drilling in the Dharwar and Haveri Districts. Within the 5,000-km^2 Dharwar Shimoga Block, Deccan Gold identified 22 targets and completed drilling in 4 of them. Drilling was also completed at Uti, which is located in the Hutti belt in Raichur (Hindu Business Line, 2004§).

India's gold production came mainly from the copper smelters as a byproduct. Birla Copper and Sterlite Industries produced more gold than the only producing gold mine at Hutti in Karnataka. Hutti Gold Mines Co. was owned by the Government of Karnataka and planned to raise output to 3.5 t/yr from 3 t/yr in 2004. The company also planned to tap the Hutti South Block at the Hirabudini Mine and to adopt bioleaching technology (Mining Journal, 2004a).

Iron and Steel.—Better management, plant modernization, and staff cuts made India one of the world's cheapest steel producers. The steel industry was on the upswing owing to strong growth in demand. India was the leading producer of sponge iron and the eighth ranked steel producer in the world. The Ministry of Steel is responsible for the planning and development of the iron and steel industry, the development of essential raw materials, and related functions.

BHP Billiton of Australia and Pohang Iron & Steel Co. Ltd. of the Republic of Korea launched a joint venture to develop iron ore deposits in eastern India. The companies planned to develop an iron ore mine, a 10-Mt/yr steel plant, and a port in Orissa (Metal-Pages, 2004h§).

Steel Authority of India Ltd. (Sail) signed a memorandum of understanding with Kudremukh Iron Ore Co. Ltd. (KIOCL) to form a 50/50 joint-venture company to develop iron ore mines at Barsua, Kalta, and Taldih in Orissa and start a pellet plant. Sail was India's leading producer of iron ore with a capacity of 20 Mt/yr, and KIOCL operated and maintained the single largest iron ore mine in India. Mecon Ltd. was engaged to prepare the feasibility study for the project, and National Mineral Development Corp. Ltd. (NMDC) would undertake the ore channelization study (Steel Authority of India Ltd., 2004§).

The Government raised the 3-Mt/yr ceiling on exports of high-grade iron ore of 65% to 66% iron from the Bellary-Hospet region to 5 Mt/yr in 2004. Ores with less than 64% iron content could be exported in any quantity without any restrictions and were free from canalization (Metal Bulletin, 2004a).

In 2004, Indian steel mills were to lose all their supplies of coke and coking coal from China owing to the restriction of its supplies for domestic consumption. India imported 3 Mt/yr of low ash coke and 15 Mt/yr of coking coal from Australia, China, Indonesia, and South Africa. India planned to seek alternative supplies and to develop its limited cokable coal reserves (Steel Times International, 2004b).

Tata Iron and Steel Co. Ltd. (Tisco) raised its ore beneficiation capacity to 400,000 t/yr from 108,000 t/yr and planned to further increase its capacity to 700,000 t/yr with an additional investment of $83 million. The initial expansion was achieved through a number of measures, which included capital investment, enhanced plant availability, and three-shift operation. The expansion project was due for commissioning by yearend 2004 (Steel Times International, 2004d).

Tisco lost 300,000 t of pig iron production in more than 3 months when its 1.2-Mt/yr blast furnace was replaced by a 1.8-Mt/yr furnace. The process, which cost $459 million, was part of its expansion program to raise plant capacity to 5 Mt/yr from 4 Mt/yr. The new furnace would be fully functional by September 2005. There was no loss in steel production (Metal Bulletin, 2004d).

NMDC decided to build a 300,000-t/yr pig iron plant based on the Russian Romelt technology. It was to be located 16 kilometers (km) from Jagdalpur at Nagarnar in the Baster District of Chhattisgarh and would process tailings from the Bailadila region. Other facilities included an oxygen plant, a waste-heat power generation plant, a lime plant, and a raw materials handling facility. The first phase of the project would cost $65.4 million and produce 300,000 t/yr of pig iron in 2005. If the plant proved successful, two more plants with capacities of 600,000 t/yr each might be added to produce a total of 1.5 Mt/yr. Romelt-Sail (India) Ltd. was formed as a joint venture between Sail and three Russian companies (Steel Times International, 2004a).

Sail planned to spend $183 million to $229 million per year during the next 8 years to increase crude steel capacity at its Bhilai works to 7 Mt/yr from 4.93 Mt/yr. It would increase the capacity of the meltshop to 3 Mt/yr from 1.5 Mt/yr. The capacity of its 1-Mt/yr plate mill would be increased. Sail also planned to build a bar and rod mill, install a new slab caster with a capacity of 800,000 t/yr, and add secondary refining units (Metal Bulletin, 2004c).

Tisco planned to increase production capacity to 15.8 Mt/yr from 4 Mt/yr by 2010. The production capacity of its Jamshedpur plant would be expanded to 7.4 Mt/yr from 4 Mt/yr in 2008. The company planned to build a steel plant in Orissa with a capacity of 6 Mt/yr and had acquired National Steel Co. Ltd. with an additional capacity of 2.4 Mt/yr. Tisco and Larsen & Toubro formed a 50/50 partnership to set up a port at Dhamra that would have the capacity to handle 13 Mt/yr of steel. The first phase investment would be $280 million. Tisco also forged a partnership with West Bengal Industrial Development Corp. to set up a 6-Mt/yr coke plant at Haldia with an investment of $70 million (Steel Times International, 2004c).

The first phase of Jindal Stainless Steel Co. Ltd.'s ferrochrome project in Orissa involved construction and installation of furnaces for the production of 150,000 t/yr of ferrochrome. The second phase would include setting up manganese-base facilities to produce 40,000 t/yr of ferromanganese and 60,000 t/yr of silicomanganese. The project was expected to be completed by May 2006 (Metal-Pages, 2004a§).

Indian Metals and Ferro Alloys Group (IMFA) started Phase 1 of a 140,000-t/yr expansion of its ferrochrome plant at Choudar in Orissa by adding a 24-megavoltoampere (MVA) furnace. Utkal Manufacturing Services Ltd. and Indian Charge Chrome Ltd. (ICCL) were responsible for the construction. IMFA and ICCL had a combined capacity of 170,000 t/yr. After the completion of the expansion in June 2005, the combined ferrochrome capacity would be 310,000 t/yr (Metal-Pages, 2004b§).

Tisco was expected to double the capacity of its Bamnipal ferrochrome plant to 110,000 t/yr from 55,000 t/yr. The plant had a 30-MVA furnace and another one on order. The company also intended to build a 60-megawatt (MW) powerplant at Bamnipal. The $66.8 million expansion project was scheduled for completion in 2007 (Metal-Pages, 2004f§).

Jindal Stainless Steel Co. Ltd. started construction of a greenfield 1.6-Mt/yr stainless steel plant at Jajpur in Orissa. The company operated a 600,000-t/yr plant at Hisar in Haryana. The plan was to commission 800,000 t/yr of capacity by March 2007 and another 800,000 t/yr by March 2009. Jindal Stainless Steel chose Orissa for the plant site because the State has sizable deposits of chrome ore, iron ore, limestone and dolomite, manganese ore, and thermal coal (Metal-Pages, 2004d§).

Manganese.—Manganese Ore India Ltd. (MOIL) was the leading producer of high-grade manganese ore in India and operated 10 major mines in the States of Madhya Pradesh and Maharashtra. MOIL also operated a 10,000-t/yr ferromanganese plant at Balaghat Mine in Madhya Pradesh and a 1,000-t/yr electrolytic manganese dioxide plant at Dongri Buzurg Mine in Maharashtra (Metal-Pages, 2004e§).

MOIL increased output by 5% in 2004 to ease the growing domestic shortage of ore and would not export any ore. MOIL produced about 850,000 t of all grades of ore in 2003; the company sold more than 600,000 t of ferro-grade material to domestic iron producers, and the remainder was sold to the domestic steel industry. Maharashtra Elektrosmelt Ltd. ordered 151,000 t; Nava Bharat, 91,000 t; and Tisco, 16,000 t. Two other manganese producers also increased output—Tisco manganese mines doubled production to 280,000 t/yr, and Sandur Manganese & Iron Ore Ltd. increased production by 50,000 t/yr to 300,000 t/yr (Metal Bulletin, 2004b).

Sandur signed a memorandum of understanding to sell its shuttered ferroalloys plant to Jindal Iron & Steel Co. (Jisco) for $11.4 million. Formalities were expected to take about 3 months to complete and for the unit to restart. Sandur offered to run the unit for Jisco and supply manganese ore for the furnace (Metal Bulletin, 2004f).

Zinc.—Hindustan Zinc Ltd. (HZL), which was 65% owned by Sterlite Industries, operated the Rajpura Dariba, Rampura Aguela, and Zawar lead/zinc mining complexes, the Chanderiya lead/zinc smelter, and the Debari zinc smelter, which are all located in Rajasthan; and the Vizag zinc smelter, which is located in Andhra Pradesh. The combined capacity of the smelters was 232,000 t/yr of zinc ingot and 35,000 t/yr of lead.

Golden Patriot Mining Inc. (GPM) of Canada signed an agreement with Binani Industries Ltd. and RBG Minerals Industries Ltd. to develop the Ambaji copper-zinc-lead deposit in Gujarat and Rajasthan. A bankable feasibility study for the project was completed by Steffen Robertson and Kirsten Inc. of the United States in 2003. After RBG recovered its investment of $229 million and repaid all debts incurred, the project's ownership would be GPM, 32.5%; Binani, 32.5%; Gujarat Minerals Development Corp., 25%; and Rajasthan State Mines & Minerals Ltd., 10%. Binani would purchase all the zinc concentrates. RBG would be free to market copper and lead concentrates and associated byproducts (Golden Patriot Mining Inc., 2004).

Industrial Minerals

Caustic Soda.—Travancore Cochin Chemicals Ltd., which was a State-owned caustic soda producer located at Eloor, planned to phase out its old mercury plant and expand the capacity of its existing membrane plant to 150 metric tons per day (t/d) from 125 t/d. The company was replacing mercury cells with membrane cell technology and expected energy conservation, clean processing, and manpower reduction. The company was provided power at concession rates by the Kerala State Electricity Board. Of the 41 plants that manufactured caustic soda in India, 67% made use of the membrane cell technology and 31% used the mercury cell process (Metal-Pages, 2004g§).

Cement.—Gujarat Ambuja Cement Ltd. was planning to add capacity through either fresh acquisition or brownfield expansion. Its sister company Ambuja Cement Eastern Ltd. was going for a 50% capacity expansion. Cement demand was expected to grow at the rate of 7% to 8% in 2004 (Building Bulletin, 2004).

Lafarge SA of France would start commercial production at its proposed 1-Mt/yr cement plant at Mejia in Bankura in West Bengal in 2006. The construction work for the plant would begin in 2005. The project cost was estimated to be about $24 million. Lafarge India contributed 2% to the total turnover of Lafarge SA and had capacities of 5 Mt/yr of cement and 3 Mt/yr of clinker. Its cement plants are located at Arasmeta and Sonadih in Chhatisgarh and at Jojobera in Jharkland (UNI India, 2004§).

Diamond.—Several diamond-mining companies were exploring for diamond in Chhattisgarh in central India. In a joint venture with Diamond Prospecting Pvt Ltd., De Beers Consolidated Mines Ltd. was prospecting a 3,975-km^2 area in the Dhamtari, Durg, Kanker, and Rajnandgaon Districts. Jindal Steel Power Ltd. was waiting for permission to explore for diamond in a 2,500-km^2 area of the Jashpur District. Admas Prospecting Pvt Ltd. was prospecting a 3,000-km^2 area in the Mahasamud and Raipur Districts. Geo Mysore Services India was granted permission to explore for diamond in a 1,220-km^2 area in the Kanker District, a 500-km^2 area in the Rajnandgaon District, and a 1,475-km^2 area in the Jashpur District. Meera Exploration Pvt Ltd. had permission to prospect for diamond in a 481-km^2 area in the Rajnandgaon District. Emperor Granite Pvt Ltd. was exploring a 1,000-km^2 area in the Kanker District. Rio Tinto Exploration Pvt Ltd. was working on a 2,800-km^2 area in the Jashpur District, an 800-km^2 area in the Mahasamund District, and a 1,360-km^2 area in the Dhamtari, Kanker, and Raipur Districts (Antwerp Facets News Service, 2004a§).

Oropa Ltd. held an interest of 18% with an option to increase it to 27% in the Block D-7 diamond project in southeast Chhattisgarh. Several diamondiferous kimberlite diatremes were identified during the past decade. Oropa's Indian joint-venture partners attempted to have the Block D-7 prospecting license and associated permits reinstated at the first opportunity. Oropa also was awaiting the issuance of a reconnaissance permit that covered a 2,400-km^2 block adjacent to Block D-7's western boundary (ASX Co., 2004§).

In the State of Madhya Pradesh, Rio Tinto was issued four reconnaissance permits for a 10,000-km^2 area in the

Chhatarpur and Panna Damoh Districts. De Beers was issued a reconnaissance permit for a survey of kimberlite pipes in the Rewa District. BHP Minerals was issued two reconnaissance permits for diamond and other minerals in the Chhatarpur, Chhindwara, Hoshangabad, Narsinghpur, and Tikamgarh Districts. NMDC was issued a reconnaissance permit for diamond in the Panna and Satna Districts (Antwerp Facets News Service, 2004b§). The Government operated the Mahjgawan open pit mine, which is located 20 km west of Panna, with a capacity of 25,000 carats per year of good-quality diamond.

Fertilizers.—The Government decided to implement the Tariff Commission's recommendations on imported and indigenous diammonium phosphate (DAP). Group 1 DAP manufacturers were those that produced from captive phosphoric acid, and Group 2 DAP manufacturers were those that produced from imported phosphoric acid. Concessions would be determined by the production and transportation costs (standard delivered prices) that were fixed at $238 per metric ton for Group 1 and $245 per ton for Group 2. The concession rates for DAP producers that used both imported and captive phosphoric acid would be in proportion to the DAP produced from the two different sources (Fertilizer Week, 2004b).

Krishak Bharati Cooperative Ltd. issued an invitation for bids on an engineering, procurement, and construction contract for its proposed gas-based fertilizer complex, which would be located at Hazira in Gujarat. The complex would consist of a 1,850-t/d single-stream ammonia plant and a 3,200-t/d single- or two-stream urea plant. The five pre-qualified bidders were Mitsubishi Heavy Industries, Ltd.; Snamprogetti Ltd.; Tecnimont ICB Ltd.; Toyo Engineering India Ltd.; and Uhde India Limited (Asia Fertilizer Week, 2004).

Shriram operated its 379,000-t/yr urea plant at 45% of capacity in January. One of its powerplants at Kota was shut down owing to a technical problem. The shutdown reduced the company's total power-generating capacity to 90 MW from 125 MW. After repairs, Shriram would restore its production rate to 100%. The company's targeted urea production for fiscal year 2003-04 was 364,000 t (Fertilizer Week, 2004a).

Mineral Fuels

Coal.—Neyveli Lignite Corp. Ltd. planned to increase the lignite production capacity of a second mine to 15 Mt/yr from 10.5 Mt/yr and to augment the power-generation capacity of its second thermal powerplant to 1,970 MW from 1,470 MW. The power expansion involved installation of two 250-MW units. The powerplant would generate and supply electricity to the States of Karnataka, Kerala, and Tamil Nadu. After implementation, total lignite production would increase to 28.5 Mt/yr and power generation would reach 2,990 MW (Yahoo India Finance, 2004§).

India produced limited quantities of coking coal needed by its steel plants. The country was a leading importer of coking coal, mostly from Australia. The Government reduced the import duty on coal to 15% from 20%. The reduction would assist the steel producers and improve their competitiveness (Mining Journal, 2004a).

Coal India Ltd. (CIL) received expressions of interest from private parties to set up coal washeries at the pitheads. CIL would provide the parties with coal, land, and power. However, setting up physical linkage between the coal washeries and the power-generation companies remained a major problem (Coal Age, 2004).

Natural Gas.—India's natural gas reserves were not large and at the current (2004) production rate of 77 million cubic meters per day would be exhausted in 28 years. Gas finds of 410 billion cubic meters in offshore Andhra Pradesh, of from 113 billion to 142 billion cubic meters in offshore Orissa by Reliance Industries, and of reserves on the east and west coasts by Oil and Natural Gas Corp. (ONGC) will further augment gas production. Output could reach to between 195 million and 200 million cubic meters per day in 7 to 8 years (Alexander's Gas & Oil Connections, 2004c§).

Reliance Industries planned to invest $2.38 billion to develop its Dhirubhai-1 and Dhirubhai-2 Gasfields in the Bay of Bengal; the two gasfields were expected to produce 40 million cubic meters per day of gas for 7½ years beginning in August 2007. The gas would arrive at a gas-processing facility near Kakinada through a 35-km-long 24-inch-diameter pipeline. Reliance, which was an operator, held a 90% interest in the project, and Niko Resources of Canada held the remaining 10% (RigZone.com, 2004§).

Following the signing of a supply agreement with Qatar's RasGas Co. Ltd., Petronet LNG would import 5 Mt/yr of liquefied natural gas (LNG) from Qatar until December 2008. Petronet had a new $547 million 5-Mt/yr receiving terminal at Dahej on the Gujarat coast. Petronet also planned to build a 2.5 Mt/yr LNG terminal at Kochi in the southern State of Kerala and was considering doubling the Dahej terminal capacity. A cost of about $130 million would be required to bring the Dahej capacity to 10 Mt/yr in 18 to 24 months. Petronet was a consortium of Indian Oil Corp., Bharat Petroleum Corp., ONGC, and Gas Authority of India Ltd. (Oil & Gas Journal, 2004b).

Total S.A. of France signed an agreement with Shell Gas LPG to acquire a 26% stake in an LNG regasification terminal project at Hazira in Gujarat. The terminal would have an initial capacity of 2.5 Mt/yr with a planned expansion to 5 Mt/yr and would be supplied by the two partners from their various LNG sources (Petroleum Economist, 2004a).

The Government embarked on a gas hydrate resource mapping project by drilling for cores at promising locations in deep waters off the Andaman Islands, Andhra Pradesh, Goa, and Kerala. Drilling at 10 locations was planned, including 5 in the Krishna Godavari Basin. Three holes would be drilled at each location to a depth of about 500 m. One hole would be cored at each location and a total of 3,000 m of cores would be removed and analyzed. A budget of $20 million was set aside for the gas hydrate coring and resource mapping project. A gas hydrate pilot production model was prepared and the pilot plant was expected to be in production in 2006 (Alexander's Gas & Oil Connections, 2004d§).

Petroleum.—India planned to offer another round of 20 oil and gas exploration blocks as well as 6 coalbed methane (CBM) exploration blocks onshore in April. Under the first three rounds of the new exploration licensing policy, $4.3 billion of investment was committed in the 70 oil and gas blocks, and

10 CBM blocks were awarded. Exploration was undertaken in deep water areas with 34 blocks awarded. In the past two years, India reported 21 discoveries, including major gas finds in the Krishna-Godavari Basin, in Vasai, and near Surat in Rajasthan. The total discoveries amounted to more than 800 Mt of oil and oil equivalent gas. In addition, a discovery of an estimated recoverable reserve of 170 billion cubic meters of gas was made offshore Myanmar. In the 10 CBM blocks, Great Eastern Energy reported the presence of 28.3 billion cubic meters of methane reserves in the Raniganj coalfields in West Bengal (Alexander's Gas & Oil Connections, 2004e§).

Gujarat State Petroleum Corp. made an oil discovery at its onshore 1,424-km^2 exploration block in Gujarat in July. No natural gas was reported from the find. Estimates of in-place oil could be as much as 40 million to 50 million barrels (Mbbl). The well PK-2, located 40 km from Ahmedabad at Pisawada, could initially produce 1,000 barrels per day (bbl/d), which could rise to 10,000 bbl/d. PK-2 was the sixth in the company's 7-well exploration program in the block. The company, which was the operator of the block, held a 50% stake, and Gas Authority of India Ltd. held the other 50% (Alexander's Gas & Oil Connections, 2004a§).

Cairn Energy plc of the United Kingdom reported a significant oil discovery in the Barmer District, which is located 60 km north of Saraswati in the Rajasthan basin in northwestern India. The company estimated oil in place to be 450 Mbbl to 1.1 billion barrels and reported that 50 to 200 Mbbl might be recoverable at the N-B-1 exploration well on the 5,000-km^2 block. The well intersected a stacked sequence of 12 oil-bearing reservoir units in the Fatehgarh formation. Cairn Energy held 100% interest in the block and started the first appraisal well and additional seismic surveys. A second oil discovery was made with its N-A-1 exploration well. Preliminary estimates of oil in place ranged from 130 Mbbl to 470 Mbbl; recoverable reserves were estimated to be 20 to 80 Mbbl (Oil & Gas Journal, 2004a).

Cairn Energy also completed appraisal drilling on the Mangala discovery in the same block in Rajasthan. The Mangala-5 well encountered 125 m of high-quality oil-bearing Fatehgarh sands. The Mangala-6 well at the southern end of the field encountered 69 m of oil in the Fatehgarh sands. First production was planned for late 2007 (Petroleum Economist, 2004b).

The first exploration well in ONGC's 3-year ultra-deep-water drilling campaign was spudded by Dolphin Drilling Ltd. The well was being drilled in the Gulf of Kutch off India's west coast from the deep water drillship *Belford Dolphin*. Dolphin Drilling managed and coordinated the project, and Norwell Limited provided the well's engineering design and project management. Schlumberger Limited provided the logging and well testing, M-I Overseas Limited the drilling fluid services, and GeoServices Corp. the mud logging service (Offshore Engineer, 2004).

The Government approved plans to raise the overseas investment limit in non-state-owned oil refiners to 100% from 74% in an effort to boost economic growth. It also raised the foreign investment limit in non-state-owned oil marketing companies to 100% from 74% and removed caps on investing in non-state-owned oil exploration companies, fuel pipelines, and scientific and technical journal publishers (Alexander's Gas & Oil Connections, 2004b§).

ONGC planned to spend $6.5 billion on power, petrochemicals, LNG, and refining projects during the next 3 to 4 years. It would build three gas-fired powerplants at Dahej, Ennore, and Managlore with a combined capacity of 3,546 MW. Two petrochemicals units would be set up at Managlore. A 10-Mt/yr LNG receiving terminal would be built at Managlore. The capacity of the 100,000-t/yr Tatipaka wellhead mini-refinery would be doubled, and another mini-refinery would be built at Ankleshwar (Petroleum Economist, 2004b).

Outlook

India's gold exploration will continue to be active after some finds by Deccan Gold Mines. Exploration for diamond is expected to increase in central India, and more reconnaissance permits are expected to be issued by the State government. The production of alumina and aluminum in India is expected to increase slightly in the next 2 to 3 years as a result of National Aluminium's expansion of its alumina refinery and aluminum smelter in Orissa. With the capacity expansions by Hindalco and Sterlite Industries, the reopening of HCL's smelter in Bihar, and the commissioning of SWIL's new plant in Gujarat, the output of copper is expected to increase substantially. New iron ore mines are expected to come onstream and the steel industry is expected to be on an upswing owing to strong domestic demand and capacity expansions by Sail and Tisco.

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TABLE 1
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
METALS						
Aluminum:						
Bauxite, gross weight	thousand metric tons	7,562 [4]	7,864 [4]	9,647 [4]	10,414 [r, 4]	11,275 [4]
Alumina, Al_2O_3 equivalent	do.	2,280	2,400	2,800	2,500	2,600
Metal, primary		643,700 [4]	624,000 [4]	671,200 [4]	798,800 [r, 4]	861,800 [4]
Cadmium metal		314 [4]	436 [4]	466 [4]	477 [4]	489 [4]
Chromium, chromite, gross weight		1,946,910 [4]	1,677,924 [4]	2,698,577 [r, 4]	2,210,000 [r, 4]	2,948,944 [4]
Cobalt metal		206 [4]	250 [4]	270 [4]	255 [4]	545 [4]
Copper:						
Mine output, Cu content		31,900 [4]	32,400 [4]	31,500 [4]	28,500 [r, 4]	28,800 [4]
Metal, primary:						
Smelter		256,000 [4]	293,000 [4]	251,400 [4]	252,000 [4]	252,000 [4]
Refinery						
Electrolytic, cathode		234,000 [4]	310,000 [4]	353,700 [4]	375,000 [4]	357,000 [4]
Fire refined		9,000	18,000	20,000	19,000	20,000
Total		243,000	328,000	374,000	394,000	377,000
Gold metal, smelter	kilograms	6,200 [4]	3,700 [4]	3,800 [4]	3,200 [r, 4]	3,800 [4]
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	75,950 [4]	79,200 [4]	86,400 [r, 4]	99,100 [r, 4]	126,000 [4]
Fe content	do.	48,600 [4]	50,700 [4]	55,300 [r, 4]	63,400 [r, 4]	80,600 [4]
Metal:						
Pig iron	do.	21,321 [4]	21,900 [4]	24,315 [4]	24,000	25,000
Direct-reduced iron	do.	5,440 [4]	5,590 [4]	5,731 [4]	5,800	5,800
Ferroalloys:						
Ferrochromium, including charge chrome		376,693 [4]	267,395 [r, 4]	311,927 [4]	468,677 [r, 4]	527,100 [4]
Ferrochromiumsilicon		10,000	10,000	10,000	10,000	10,000
Ferromanganese		160,000	165,000	165,000	165,000	170,000
Ferrosilicon		60,000	50,000	52,000	54,000	55,000
Silicomanganese		185,000	150,000	150,000	160,000	160,000
Other		9,000	9,000	9,000	9,000	9,000
Steel, crude	thousand metric tons	26,924 [4]	27,291 [4]	28,814 [4]	31,779 [4]	32,000
Semimanufactures[5]	do.	12,000	13,000	13,500	14,000	14,000
Lead:						
Mine output, Pb content		28,900 [4]	25,600 [4]	28,600 [4]	34,400 [r, 4]	39,800 [4]
Metal, refined:						
Primary		57,400 [4]	74,400 [4]	74,200 [r, 4]	77,500 [r, 4]	41,700 [4]
Secondary		20,500 [4]	22,000 [4]	35,000 [r, 4]	41,000 [r, 4]	25,000 [4]
Total		77,900 [4]	96,400 [4]	109,200 [r, 4]	118,500 [r, 4]	66,700 [4]
Manganese:						
Ore and concentrate, gross weight	thousand metric tons	1,550	1,600	1,700	1,650	1,700
Mn content	do.	590	600	630	620	630
Rare-earth metals, monazite concentrate, gross weight		5,000	5,000	5,000	5,000	5,000
Selenium	kilograms	11,500	11,500	11,500	12,000	12,000
Silver, mine and smelter output	do.	40,500 [r]	49,500 [4]	52,100 [4]	51,200 [r, 4]	13,300 [4]
Titanium concentrates, gross weight:						
Ilmenite		380,000	430,000	460,000	500,000	520,000
Rutile		17,000	19,000	18,000	18,000	19,000
Zinc:						
Mine output, concentrate:						
Gross weight		264,000	270,000	234,300 [4]	294,200 [4]	327,700 [4]
Zn content		144,000	146,000	129,000	162,000	184,000

See footnotes at end of table.

TABLE 1—Continued
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
METALS—Continued						
Zinc—Continued:						
Metal:						
Primary		176,000	207,000 [4]	231,400 [4]	253,900 [4]	238,400 [4]
Secondary		25,000	25,000	24,000	24,000	24,000
Total		201,000	232,000	255,000	278,000	262,000
Zirconium concentrate, zircon, gross weight		19,000	19,000	19,000	20,000	20,000
INDUSTRIAL MINERALS						
Abrasives, natural, n.e.s.:						
Corundum, natural	kilograms	1,250	1,200	1,200	1,150	1,100
Garnet		130,000	125,000	120,000	120,000	125,000
Jasper		7,500	8,000	8,000	8,500	8,500
Asbestos		21,000	21,000	18,000	19,000	18,000
Barite		840,000	850,000	916,000 [r]	675,000 [r]	723,000
Bromine, elemental		1,500	1,500	1,500	1,500	1,500
Cement, hydraulic	thousand metric tons	95,000	105,000 [r]	115,000 [r]	123,000 [r]	125,000
Chalk		110,000	110,000	110,000	115,000	115,000
Clays:						
Ball clay		375,000	370,000	400,000	390,000	400,000
Diaspore		13,000	13,000	12,000	12,000	11,000
Fireclay		345,000	350,000	355,000	360,000	365,000
Kaolin:						
Salable crude	thousand metric tons	530	540	540	550	550
Processed	do.	160	170	170	180	180
Total	do.	690	710	710	730	730
Other	do.	70	70	70	75	75
Diamond:						
Gem	thousand carats	16	17	17	16	16
Industrial	do.	41	43	45	44	43
Total	do.	57	60	62	60	59
Feldspar		110,000	110,000	110,000	150,000	150,000
Fluorspar:						
Concentrates, metallurgical-grade		3,782 [r, 4]	13,866 [r, 4]	6,296 [r, 4]	6,300 [r]	6,400
Other fluorspar materials, graded		3,253 [r, 4]	6,900 [r, 4]	4,188 [r, 4]	4,200 [r]	4,300
Gemstones, excluding diamond:						
Agate, including chalcedony pebble		250	250	200	200	200
Garnet	kilograms	850	900	700	800	850
Graphite[6]		140,000	140,000	130,000	110,000	120,000
Gypsum		2,210,000	2,250,000	2,300,000	2,300,000	2,350,000
Kyanite and related materials:						
Kyanite		5,000	5,500	6,000	6,000	6,200
Sillimanite		12,000	13,000	14,000	14,000	14,500
Lime		910,000 [r]	910,000 [r]	900,000 [r]	900,000 [r]	900,000
Magnesite		365,000	370,000	380,000	380,000	370,000
Mica:						
Crude		1,500	1,300	1,500	1,600	1,600
Scrap and waste		950	1,100	2,000	2,000	2,100
Total		2,450	2,400	3,500	3,600	3,700
Nitrogen, N content of ammonia	thousand metric tons	10,148 [4]	10,081 [4]	9,827 [4]	10,048 [r, 4]	10,718 [4]
Phosphate rock, including apatite		1,136,000 [4]	1,200,000	1,250,000	1,175,000 [r, 4]	1,180,000
Pigments, mineral, natural, ocher		336,000	355,000	360,000	365,000	360,000
Pyrites, gross weight		105,000	110,000	115,000	115,000	120,000

See footnotes at end of table.

TABLE 1—Continued
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
INDUSTRIAL MINERALS—Continued						
Salt:						
Rock salt	thousand metric tons	3	3	3	3	3
Other	do.	14,450 [4]	14,500	14,500	15,000	15,000
Total	do.	14,500	14,500	14,500	15,000	15,000
Sand:						
Calcareous	do.	240	245	250	250	255
Silica	do.	1,350	1,400	1,400	1,500	1,500
Other	do.	2,800	2,900	2,800	2,900	3,000
Slate		10,500	11,000	10,000	10,500	11,000
Soda ash		1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Stone, sand and gravel:						
Calcite		50,500	51,000	51,000	52,000	52,000
Dolomite	thousand metric tons	2,750	2,800	2,900	2,900	3,000
Limestone	do.	105,000	110,000	115,000	120,000	125,000
Quartz and quartzite	do.	260	270	250	250	260
Sulfur, byproduct from fertilizer plants		11,000	11,000	11,500	11,500	12,000
Talc and related materials:						
Pyrophyllite		85,000	86,000	85,000	86,000	86,000
Steatite, soapstone		545,000	546,000	550,000	552,000	550,000
Vermiculite		4,200	4,300	4,300	4,400	4,400
Wollastonite		100,000	100,000	105,000	120,000	115,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand metric tons	310,800 [4]	320,500 [4]	325,000	328,000	330,000
Liginte	do.	24,000	23,000	24,000	25,000	25,000
Total	do.	334,800 [4]	343,500 [4]	349,000	353,000	355,000
Gas, natural:						
Gross	million cubic meters	30,000	25,519 [4]	26,000	27,000	28,000
Marketable	do.	28,500	24,000	25,000	25,000	26,000
Petroleum:						
Crude	thousand 42-gallon barrels	238,068 [4]	239,292 [4]	240,000	241,000	244,000
Refinery products:						
Liquefied petroleum gas	do.	41,500	42,000	43,000	44,000	44,000
Gasoline	do.	40,500	41,000	42,000	42,000	43,000
Kerosene and jet fuel	do.	59,000	58,000	60,000	59,000	60,000
Distillate fuel oil	do.	169,000	170,000	172,000	171,000	172,000
Residual fuel oil	do.	68,000	67,000	69,000	70,000	71,000
Other	do.	91,500	92,000	94,000	93,000	93,000
Total	do.	470,000	470,000	480,000	479,000	483,000

[r] Revised.

[1] Table includes data available through August 4, 2005.

[2] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[3] In addition to commodities listed, other gemstones (aquamarine, emerald, ruby, and spinel) and uranium are produced, but output is not reported; available information is inadequate to make reliable estimates of output levels.

[4] Reported figure.

[5] Excludes production from steel miniplants.

[6] India's marketable production is 10% to 20% of mine production.

TABLE 2
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Alumina	Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]	Belgaum Refinery, Karnataka	280
Do.	National Aluminium Co. Ltd. (Indian Government, 100%)	Dhamanjodi Refinery, Orissa	1,580
Do.	Bharat Aluminium Co. Ltd. (Indian Government, 49%, and Sterlite Industries Ltd., 51%)	Korba Refinery, Chhattisgarh	200
Do.	Utkal Alumina International Ltd. [Norsk Hydro A/S (Norway), 45%; Alcan Aluminium Ltd. (Canada), 35%; Hindalco Industries Ltd., 20%]	Koraput Refinery, Orissa	1,000 [1]
Do.	Madras Aluminium Co. Ltd. [Alumix SpA (Italian Government), 27%; R. Prabhu and Associates, 24%; Tamil Nadu Industrial Investment Corp., 11%; others, 38%]	Mettur Refinery, Tamil Nadu	60
Do.	Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]	Muri Refinery, Jharkhand	88
Do.	Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Renukoot Refinery, Uttar Pradesh	450
Aluminum	Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]	Alupuram Smelter, Kerala	20
Do.	National Aluminium Co. Ltd. (Indian Government, 100%)	Angul Smelter, Orissa	345
Do.	Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]	Belgaum Smelter, Karnataka	70
Do.	Do.	Hirakud Smelter, Orissa	30
Do.	Bharat Aluminium Co. Ltd. (Indian Government, 49%, and Sterlite Industries Ltd., 51%)	Korba Smelter, Chhattisgarh	100
Do.	Madras Aluminium Co. Ltd. [Alumix SpA (Italian Government), 27%; R. Prabhu and Associates, 24%; Tamil Nadu Industrial Investment Corp., 11%; others, 38%]	Mettur Smelter, Tamil Nadu	25
Do.	Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Renukoot Smelter, Uttar Pradesh	275
Barite	Andhra Pradesh Mineral Development Corp. Ltd. (Andhra Pradesh State Government, 100%)	Cuddapah District mines, Andhra Pradesh	350
Do.	Associated Mineral Corp.	do.	75
Do.	Pragathi Minerals	do.	50
Do.	Shri C.M. Ram nath Reddy	do.	75
Do.	Vijaylaxmi Minerals Trading Co.	do.	50
Bauxite	Bharat Aluminium Co. Ltd. (Indian Government, 49%, and Sterlite Industries Ltd., 51%)	Amarkantak Mine, Madhya Pradesh	200
Do.	Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]	Kolhapur District mines, Maharashtra	600
Do.	Gujarat Mineral Development Corp. (Gujarat State Government, 100%)	Kutch and Saurashtra Mines, Gujarat	500
Do.	Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; financial institutions, 18%)	Lohardarga District mines, Jharkland	750
Do.	Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]	do.	200
Do.	National Aluminium Co. Ltd. (Indian Government, 100%)	Panchpatmali Hills, Koraput District mines, Orissa	4,800
Do.	Minerals & Minerals Ltd. (Indian Government, 100%)	Richuguta, Palamau District mines, Jharkland	200
Borax	Borax Morarji Ltd.	Ambernath, Maharashtra	17
Cement	Larsen and Toubro Ltd.	Awarpur Plant, Maharashtra	2,300
Do.	Century Cement (Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%)	Baikunth Plant, Madhya Pradesh	1,120

See footnotes at end of table.

TABLE 2—Continued

INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Cement—Continued:	Coromandel Fertilizers Ltd. [Chevron Chemical Co. (United States), 23.55%; International Minerals and Chemical Co., 20.89%; Parry and Co., 10.64%; E.I.D. Parry (India) Ltd., 6.65%; others, 38.27%]	Chilamkur Plant, Andhra Pradesh	1,000
Do.	The Associated Cement Cos. Ltd. (Indian Government, 34.86%, and private shareholders, 65.14%)	Gagal Plant, Himachal Pradesh	1,830
Do.	Raymond Cement Works (a division of Raymond Woolen Mills Ltd., JK Singhania, principal shareholder)	Gopalnagar Plant, Madhya Pradesh	1,250
Do.	Narmada Cement Co. Ltd. (Chowgule and Co. Ltd., 34%; Gujarat State Government, 17.33%; others, 48.67%)	Jafrabad Plant, Gujarat	1,000
Do.	Rajashree Cement (a division of Indian Rayon and Industries Ltd., 100%)	Khor Plant, Karnataka	1,020
Do.	The Associated Cement Cos. Ltd. (Indian Government, 34.86%, and private shareholders, 65.14%)	Kymore Plant, Madhya Pradesh	1,500
Do.	Mangalam Cement Ltd.	Morak Plant, Rajasthan	1,000
Do.	Mysore Cements Ltd. (Government institutions and banks, 41.13%; Corporate Trust Holdings, 21.70%; others, 37.17%)	Narasingarh Plant, Madhya Pradesh	1,089
Do.	Cement Corp. of India Ltd. (Indian Government, 100%)	Nayagaon Plant, Madhya Pradesh	1,330
Do.	JK Cement Works (a division of JK Synthetics Ltd., 100%)	Nimbahera Plant, Rajasthan	1,462
Do.	The India Cement Co. Ltd. (Indian Government, 26%; Life Insurance Corp. of India, 24%; others, 50%)	Sankarnagar Plant, Tamil Nadu	1,000
Do.	Maihar Cement (Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%)	Satna Plant, Madhya Pradesh	1,800
Do.	Shree Digvijay Cement Co. Ltd.	Shreeniwas Plant, Maharashtra	1,060
Do.	Lakshmi Cement (a division of Straw Products Ltd., JK Singhania, principal shareholder)	Sirohi Plant, Rajasthan	1,400
Do.	Manikgarth Cement (Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%)	Tehsil Rajura Plant, Maharashtra	1,000
Do.	Vasavadatta Cement (Kesoram Industries Ltd., 100%)	Vasavadatta Plant, Karnataka	1,000
Do.	Vikram Cement (Grasim Industries Ltd., a subsidiary of the Birla Group, 100%)	Vikram Plant, Madhya Pradesh	1,000
Do.	Raasi Cement Ltd. (Andhra Pradesh Government, 50%, and Development Co. Ltd., 50%)	Vishnupuram Plant, Andhra Pradesh	1,000
Do.	The Associated Cement Cos. Ltd. (Indian Government, 34.86%, and private shareholders, 65.14%)	Wadi Plant, Karnataka	2,180
Chromite	Ferro Alloys Corp. Ltd.	Cuttack District, Orissa	120
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	300
Do.	Tata Iron and Steel Co. Ltd.	do.	100
Do.	Ferro Alloys Corp. Ltd.	Dhenkanal District, Orissa	75
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	200
Do.	Mysore Minerals Ltd.	Hassan District, Karnataka	125
Do.	Ferro Alloys Corp. Ltd.	Kendujhar District, Orissa	75
Do.	Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)	do.	100
Do.	Ferro Alloys Corp. Ltd.	Khammam District, Andhra Pradesh	100
Coal, bituminous million metric tons	Bharat Coking Coal Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Bihar and West Bengal	26
Do. do.	Central Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Bihar	27
Do. do.	Eastern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Bihar and West Bengal	21
Do. do.	Mahanadi Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Orissa	21
Do. do.	North Eastern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Assam	640

See footnotes at end of table.

TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Coal, bituminous—Continued:	million metric tons	Northern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Madhya Pradesh and Uttar Pradesh	24
Do.	do.	Singareni Collieries Co. Ltd. (Andhra Pradesh State Government, 50%, and Indian Government, 50%)	Andhra Pradesh	18
Do.	do.	South Eastern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Madhya Pradesh	36
Do.	do.	Western Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)	Madhya Pradesh and Maharashtra	18
Coal, lignite	do.	Neyveli Lignite Corp. Ltd. (Indian Government, 100%)	Tamil Nadu	17
Copper, mine		Hindustan Copper Co. Ltd. (Indian Government, 100%)	Indian Copper Complex mines, Ghatsila District, Bihar	31
Do.		do.	Khetri Copper Complex mines, Khetrinagar Rajasthan	15
Do.		do.	Malanjkhand Copper Complex mines, Balaghar District, Madhya Pradesh	22
Copper, metal		Birla Copper	Birla Copper Complex smelter, Dahej, Gujarat	150
Do.		Hindustan Copper Co. Ltd. (Indian Government, 100%)	Indian Copper Complex smelter-refinery Ghatsila District, Bihar	20
Do.		do.	Khetri Copper Complex smelter-refinery Khetrinagar District, Rajasthan	45
Do.		Sterlite Industries Ltd.	Tuticorin Smelter, Tamil Nadu	180
Do.		do.	Silvassa Refinery, Gujarat	180
Diamond	carats	Indian Government	Mahjgawan Mine	25,000
Gold	kilograms	Hutti Gold Mines Co.	Hutti Mine, Karnataka	3,000
Ilmenite-rutile ore		Kerala Minerals and Metals Ltd. (Kerala State Government, 100%)	Chavara, Kerala	100
Do.		Indian Rare Earths Ltd. (Indian Government, 100%)	do.	200
Do.		do.	Ganjam, Orissa	220
Do.		do.	Manavalakurichi, Tamil Nadu	65
Do.		VV Minerals Ltd.	Kanyakumari, Tamil Nadu	130
Iron and steel:				
Crude steel		Visvesvaraya Iron and Steel Ltd. (Karnataka State, 60%, and Steel Authority of India Ltd., Indian Government, 40%)	Bhadravati steel plant, Karnataka	180
Do.		Steel Authority of India Ltd. (Indian Government, 100%)	Bhilai steel plant, Madhya Pradesh	4,930
Do.		do.	Bokaro steel plant, Bihar	4,000
Do.		Indian Iron and Steel Co. Ltd. (wholly owned subsidiary of Steel Authority of India Ltd., Indian Government, 100%)	Burnpur steel plant, West Bengal	1,500
Do.		Steel Authority of India Ltd. (Indian Government, 100%)	Durgapur steel plant, West Bengal	1,600
Do.		Tata Iron and Steel Co. Ltd.	Jamshedpur steel plant, Bihar	4,000
Do.		Steel Authority of India Ltd. (Indian Government, 100%)	Rourkela steel plant, Orissa	1,800
Do.		Rashtriya Ispat Nigam Ltd.	Visakhapatnam steel plant, Andhra Pradesh	3,200
Do.		Ministeel plants (privately owned)	About 180 plants located throughout India	4,700
Iron ore		National Mineral Development Corp. Ltd. (Indian Government, 100%)	Bailadila, Madhya Pradesh	9,000
Do.		Steel Authority of India Ltd. (Indian Government, 100%)	Bastar and Durg District, Madhya Pradesh	7,000
Do.		Kudremukh Iron Ore Co. Ltd. (Indian Government, 100%)	Kudremukh, Chikmagalur District, Karnataka	10,300
Do.		National Mineral Development Corp. Ltd. (Indian Government, 100%)	Donimalai, Karnataka	9,000
Do.		Chowgule and Co. Ltd.	Goa	2,500

See footnotes at end of table.

TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Iron ore—Continued:		Dempo Mining Corp. Ltd.	Goa	2,500
Do.		V.M. Salgaocar & Bros. Pvt. Ltd.	do.	2,500
Do.		Sesa Goa Ltd.	Codli and Sonshi, Goa	NA
Do.		Steel Authority of India Ltd. (Indian Government, 100%)	Kendujhar District, Orissa	3,000
Do.		Tata Iron and Steel Co. Ltd.	do.	2,000
Do.		Indian Iron and Steel Co. Ltd. (wholly owned subsidiary of Steel Authority of India Ltd., Indian Government, 100%)	Singhbhum District, Bihar	2,500
Do.		Steel Authority of India Ltd. (Indian Government, 100%)	do.	3,500
Do.		Tata Iron and Steel Co. Ltd.	do.	3,500
Kyanite		Associated Mining Co.	Bhandara District, Maharashtra	10
Do.		Maharashtra Mineral Corp. Ltd.	do.	10
Do.		Bihar State Mineral Development Corp. Ltd. (Bihar State Government, 100%)	Singhbhum District, Bihar	10
Do.		Hindustan Copper Co. Ltd. (Indian Government, 100%)	do.	22
Lead ore		Hindustan Zinc Ltd. (Indian Government, 100%)	Agnigundala Mine, Andhra Pradesh	72
Do.		do.	Sargipalli Mine, Orissa	150
Lead:				
Primary		Hindustan Zinc Ltd. (Indian Government, 100%)	Chanderiya Smelter, Rajasthan	35
Do.		do.	Tundoo Smelter, Bihar	8
Secondary		Indian Lead Co.	Thane Refinery, Mumbai, Maharashtra	25
Do.		do.	Wada, Mumbai, Maharashtra	40
Lead-zinc ore		do.	Rampura-Agucha Mine, Rajasthan	1,300
Do.		do.	Zawar mine group, Rajasthan	1,200
Magnesite		Burn Standard Co. Ltd. (Indian Government, 100%)	Salem, Tamil Nadu	150
Do.		Dalmia Magnesite Corp.	do.	150
Do.		Tamil Nadu Magnesite Ltd. (Tamil Nadu State Government, 100%)	do.	150
Manganese ore[2]		Manganese Ore India Ltd. (Indian Government, 100%)	Adilabad, Andhra Pradesh	NA
Do.		Falechand Marsingdas	Andhra Pradesh	NA
Do.		Manganese Ore India Ltd. (Indian Government, 100%)	Balaghat, Madhya Pradesh	NA
Do.		J.A. Trivedi Bros.	do.	NA
Do.		Sandur Manganese and Iron Ores Ltd.	Bellary, Karnataka	NA
Do.		Manganese Ore India Ltd. (Indian Government, 100%)	Bhandara, Maharashtra	NA
Do.		Eastern Mining Co.	North Kanara, Karnataka	NA
Do.		Mysore Minerals Ltd.	do.	NA
Do.		Manganese Ore India Ltd. (Indian Government, 100%)	Keonjhar, Orissa	NA
Do.		Mangilah, Rungta (Pvt.) Ltd.	do.	NA
Do.		Orissa Mining Corp. Ltd.	do.	NA
Do.		Rungta Mines (Pvt.) Ltd.	do.	NA
Do.		Serajuddin & Co.	do.	NA
Do.		S. Lall & Co.	do.	NA
Do.		Tata Iron and Steel Co. Ltd.	do.	NA
Do.		Orissa Mineral Development Co. Ltd.	Koraput, Orissa	NA
Do.		Orissa Mining Corp. Ltd.	do.	NA
Do.		Mysore Minerals Ltd.	Shimoga, Karnataka	NA
Do.		Aryan Mining & Trading Corp.	Sundargarh, Orissa	NA
Do.		Orissa Manganese & Minerals (Pvt.) Ltd.	do.	NA
Do.		Tata Iron and Steel Co. Ltd.	do.	NA
Do.		R.B.S. Shreeram Durga Prasad and Falechand Marsingdas	Vizianagaram, Andhra Pradesh	NA
Petroleum, refined products	thousand 42-gallon barrels per day	Cochin Refineries Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 55%, and private interests, 45%)	Ambalamugal Refinery, Kerala	93,000
Do.	do.	Indian Oil Corp. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 91%, and private interests, 9%)	Barauni Refinery, Bihar	66,000

See footnotes at end of table.

TABLE 2—Continued
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Petroleum, refined products—Continued:	thousand 42-gallon barrels per day	Bongaigaon Refinery and Petrochemicals Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 100%)	Bongaigaon Refinery, Assam	27,000
Do.	do.	Indian Oil Corp. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 91%, and private interests, 9%)	Digboi Refinery, Assam	12,000
Do.	do.	do.	Guwahati Refinery, Assam	20,000
Do.	do.	do.	Haldai Refinery, West Bengal	61,000
Do.	do.	do.	Koyali Refinery, Gujarat	185,000
Do.	do.	Madras Refineries Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 52%, and private interests, 48%)	Madras Refinery, Tamil Nadu	131,000
Do.	do.	Bharat Petroleum Corp. Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 67%, and private interests, 33%)	Mahul Refinery, Mumbai, Maharashtra	135,000
Do.	do.	Industan Petroleum Corp. Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 51%, and private interests, 49%)	do.	110,000
Do.	do.	do.	Visakhapatnam Refinery, Andhra Pradesh	90,000
Do.	do.	Indian Oil Corp. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 91%, and private interests, 9%)	Mathura Refinery, Uttar Pradesh	156,000
Do.	do.	do.	Panipat Refinery, Haryana	120,000
Phosphate rock[3]		Rajasthan State Mineral Development Corp. Ltd. (Rajasthan State Government, 100%)	Badgaon, Dakankotra, Kanpur, Kharbaria-ka-Guda, and Sallopat Mines, Rajasthan	NA
Do.		Pyrites Phosphates and Chemicals Ltd.	Durmala and Maldeota underground mines, Uttar Pradesh	NA
Do.		Madhya Pradesh State Mining Corp. Ltd. (Pradesh State Government, 100%)	Hirapur and Khatamba Mines, Madhya Pradesh	NA
Do.		Rajasthan State Mines and Minerals Ltd. (Rajasthan State Government, 100%)	Jhamarkotra Mine, Rajasthan	NA
Do.		Hindustan Zinc Ltd. (Indian Government, 100%)	Maton Mine, Rajasthan	NA
Zinc		Binani Zinc Ltd.	Binanipuram Smelter, Kerala	38
Do.		Hindustan Zinc Ltd. (Indian Government, 100%)	Chanderiya Smelter, Rajasthan	100
Do.		do.	Debari Smelter, Rajasthan	78
Do.		do.	Visakhapatnam (Vizag) Smelter, Andhra Pradesh	54

[e] Estimated. NA Not available.

[1] Scheduled for startup in 2005.

[2] Capacity of clusters of surface mines varies extremely, depending on demand. Estimated total capacity is 1.5 million metric tons per year.

[3] Estimated total phosphate rock capacity is 800,000 metric tons per year.

THE MINERAL INDUSTRY OF INDONESIA

By Pui-Kwan Tse

Despite the bombing outside the Australian Embassy in September and the tragic tsunami in December, the expansion of Indonesia's economy was stronger than expected. In 2004, Indonesia's real gross domestic product (GDP) grew by 5.1% compared with that of 2003; this growth rate was higher than the Government's target of 4.8%. The inflation rate increased by 6.2%, which was the lowest in 4 years.

The December tsunami claimed at least 200,000 lives in the Indonesian Province of Aceh; the Province had accounted for 2.2% of the total GDP in 2003. The agriculture sector contributed about 30% of the Province's revenue, and 40% came from the production of oil and gas. Oil and gas production facilities were not damaged in the tsunami disaster. In 2004, increased productivity and higher prices resulted in a 4% increase in the agriculture sector. The estimated economic impact of the disaster was calculated to be $4.5 billion at replacement cost and was expected to reduce national GDP growth by 0.1% to 0.4% in 2005.

Spurred by investment in property, the construction sector grew by 8.2%. The growth rate of transport and communications increased by 12.7%. Owing to the increased demand for cement and transportation equipment, the manufacturing sector grew by 6.2%. Despite higher global prices for minerals and oil, mining output fell by 4.6% because of the decline investment and poor security at some mines. Although labor-intensive agriculture continued to have a dominant role in the country's economy, revenues from the mineral sector provided about 25% of the Government's budget. The mining sector engaged about 0.5% of the labor force and contributed about 3% of the GDP (Asian Development Bank, 2005, p. 3-7; Bank Indonesia, 2005; World Bank, 2005a, b).

In 2004, foreign investment approvals by the Capital Investments Coordinating Board fell by 26.8% to $10.3 billion. Although foreign companies invested less in their existing plants, the value of foreign-invested project approvals increased slightly to $5.4 billion. In the second half of 2004, the economic index showed that the growth had shifted from consumption to investment. During that period, investment grew by 19%, while private consumption grew by only 4.4% and Government consumption decreased by 2.5%. The growth still remained well below the precrisis level of 1997. The Government predicted that the Indonesian economy would grow by 5.4% in 2005 and that the growth rate would reach 7% in 2009 (Capital Investment Coordinating Board, 2005a§[1], b§).

Government Policies and Programs

Indonesia's principal mineral resources are coal, copper, gold, nickel, oil, and tin. Mining provides significant local employment, directly at the mine site and indirectly through the supply of goods and services from Indonesian sources. A significant part of Indonesia remains unexplored; some of these land areas have the most prospects for mineral development. The mining sector could have the potential to become a much larger contributor to the country's economy and to regional development. In recent years, mining investment has slowed because of external factors, such as declines in world mineral and metal prices, and also owing to a decline in Indonesia's competitiveness in the world. Investors and lenders were concerned about fair and competitive taxation. The agreements between investors and the Central Government would be honored, and future taxes would be stable and predictable. The Government was aware of the need to attract investment and has taken various steps to improve the investment climate. To improve investment climate requires institutional reforms (Petrominer, 2005e; World Bank, 2005c).

The economic stability maintained throughout 2004 had provided a more-solid foundation for stronger economic performance in 2005 and the years to come. The House of Representatives passed law No. 25/2004 on the National Planning System and required the newly elected Government (October 2004) to develop a 5-year development plan after 3 months in power. The Government's regulation No. 7/2005 provided the guidance for the development in the next 5 years. The Government will provide adequate infrastructure, try to revitalize local economies, focus on agriculture and manufacturing, strengthen small- and medium-sized enterprises, and ensure legal certainty for businesses. The Government planned to maintain fiscal and monetary stability and to reform the tax system. The target for economic growth was 7.6% in 2009, and per capita income could increase to $1,731 in 2009 from $968 in 2004. The investment contribution target was set at 30% of the GDP in 2009, which was an increase from 16.7% in 2004 (Jakarta Post, The, 2005d§).

Since the implementation of laws No. 22/1999 (regional autonomy law) and No. 25/1999 (fiscal decentralization law) in 2001, the operation and distribution of gas, mining, and oil revenue (such as land rent, royalties, and taxes) had been misunderstood. Foreign direct investment is very important to the Indonesian economy because it not only creates new jobs, but also provides financing for the development of projects, especially for infrastructure, that are crucial to ensure sustainable development. The regional autonomy law had not provided significant changes to social welfare and democracy but discouraged trade and investment. The survey conducted by the Indonesian Chamber of Commerce and Industry found 881 bylaws issued by 225 cities and regencies. Of those, 297 were identified as discouraging investment. Some of the bylaws have created tariff barriers for certain goods and required producers to pay extra taxes to ship natural-resource-based products into or out of the regency. Some regencies and municipalities imposed additional taxes on employers for hiring workers from outside those areas. In 2004, the Central Government amended the regional autonomy law with law No. 32/2004 and fiscal decentralization law with law No. 33/2004 (financial balance between the Central Government and local governments). In addition to handling defense and foreign, monetary, and religious affairs, the Central Government assumed the authority to develop, control, and implement general policies in all sectors. The Central Government also centralized the recruitment of civil servants and the appointment of local officials (Jakarta Post, The, 2004b§, 2005e§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

After more than 4 years of discussion, the draft of the new mining law that will replace the general mining law No. 11/1967 has not been completed. Replacement of law No. 11/1967 was considered to be necessary because the old law was not compatible with current conditions in the mining sector, which had changed considerably during the past several years. The new draft bill will be called the Mineral and Coal Mining Law. The fundamental changes in the new draft bill are as follows: the term contract of work (CoW) will be replaced by a mining license, and the mining authority will be replaced by a people's mining license. The draft bill will strengthen such environmental concerns as mining safety, waste disposal, and postmining land reclamation. The draft bill will be submitted to the State Secretariat for approval before it is submitted to the House of Representatives for consideration in 2005 (Petrominer, 2005d).

Law No. 41/1999 banned opencast mining in protected forest areas; according to the law, however, the House of Representatives could grant a special permit to allow mining in protected forest areas. The House of Representatives and the Ministry of Energy and Mineral Resources jointly established a team to evaluate how the forest law affected mining companies. The team recommended that 22 mining companies be allowed to mine in protected forest areas. The recommendation was based on the companies' stage of mining, their disbursed investment value, and the impact of their operations on the environment. The Government issued the Government Ordinance in Lieu of Law (Perpu) No. 1/2004 in November 2003; the President signed the Perpu in 2004 to allow 13 companies to resume their operations in protected forests. (A Perpu is similar to a law, but issuance of a Perpu does not require House approval.) These companies were PT Antam Tbk (Bulit N. Maluku and Bahobulu Southeast Sulawesi), PT Freeport Indonesia Co. (Freeport) (Mimika and Punccak Jayawijaya in Papua), PT Gag Nickel, PT International Nickel Indonesia Tbk (PT Inco), PT Indominco Mandiri, PT Interex Sacra Raya, PT Karimun Granite, PT Natarang Mining, PT Nusa Halmahera Minerals, PT Sorik Mas Mining, PT Telsart Tambang Kencana, and PT Weda Bay Nickel. These companies have proven reserves that were considered to be economic to mine. In July, the House of Representatives endorsed the Perpu on Law No. 19/2004. A coalition of 11 nongovernmental organizations filed a complaint in the Constitutional Court on the ground of incompatible with the 1945 constitution (Petrominer, 2005c; Miningindo.com, 2004e§).

In November, the Constitutional Court annulled law No. 20/2002 regarding electricity on the grounds that it allowed for competition and the separation and distribution in the electricity sector, which was incompatible with the 1945 constitution and reinstated law No. 15/1985. The Court also ruled, however, that all power sale contracts signed during the time of the 2002 electricity law would remain valid. The court decision has created uncertainty about the reform of the power sector. The Government issued regulation No. 3/2005 to implement law No. 15/1985 and planned to revise it based upon the Constitutional Court's concerns, and would submit the revision to Parliament (Petrominer, 2005d, e). In December, the Constitutional Court also invalidated as unconstitutional several parts of law No. 22/2001 (oil and gas law) aimed at opening the industry to competition (Petrominer, 2005a)

Law No. 18/2000 [value-added-tax (VAT) law], which took effect on January 1, 2001, classified coal, gold, and silver as nontaxable commodities. Any taxable expenditures that were incurred to produce these commodities were nonrefundable and could increase production costs by 10% for many companies. The Ministry of Finance (MOF) issued regulation No. 144/2000 on law No. 18/2000. In March, the Supreme Court ruled that the regulation regarding coal contradicted the VAT law. The MOF planned to revise law No. 144/2000 in 2005 (Miningindo, 2005a§).

Trade

Indonesia liberalized its trade regime and took a number of important steps to reduce protectionism. In the early 1990s, the Government initiated a series of annual deregulation measures that were designed to lower tariff rates gradually. As of January 2004, the Government released a new tariff reduction package that categorized tariffs into international non-Association of Southeast Asian Nations (ASEAN) tariffs and ASEAN tariffs. Most non-ASEAN products have tariffs of 0%, 5%, or 10%, except for such sensitive items as automotive goods and alcohol. Tariffs on products originating from ASEAN countries were 0%, 2.5%, and 5%. In the Uruguay Round of market access negotiations, Indonesia committed to bind 94.6% of its tariff schedule; most tariffs were bound at 40%. Products for which tariff bindings exceeded 40% or that remained unbound included automobiles, iron and steel, and some chemical products. In June, the Ministry of Trade banned the importation of salt during the harvest season from July to December. Under the regulations, salt-importing companies must be registered and source 50% of their raw materials locally. Owing to shortage of raw materials, the MOF reduced tariff rate of hot- and cold-rolled coils and steel plate to 0% (Ministry of Finance, 2004).

In 2004, Indonesia's exports increased by 11.5% to $69.7 billion, and imports increased by 39.6% to $46.2 billion. Oil and gas exports accounted for 22.4% ($15.6 billion) of the export total. Indonesia increased its oil and gas imports to $11.6 billion, or 25.2% of the import total. Mining products accounted for 6.5% of the export total. In terms of value, coal, copper, and nickel concentrates were the leading exported mineral commodities. Japan was the leading destination for Indonesian non-oil-and-gas products followed by the United States, Singapore, and China. Because China's Government restricted coal exports, Indonesia's coal exports increased to 105.6 million metric tons (Mt) in 2004 from 89.0 Mt in 2003; Japan, Hong Kong, India, the Republic of Korea, Malaysia, and Taiwan were major markets for Indonesian coal. Indonesia imports on non-oil-and-gas products were from China, Japan, Singapore, and the United States. The value of aluminum exports increased by 5.3% to $1.2 billion, but the value of copper exports decreased by 33% to $2.0 billion as a result of the October 2003 landslide at the Grasberg Mine, and coal prices in the Asian market increased to $33 per metric ton from $27 per ton in the fourth quarter of 2003. Machinery and mechanical equipment was the leading non-oil-and-gas import category and accounted for 12.9% of the total value of imports. The value of iron and steel imports decreased by 8.6% to $2.0 billion because the Government restricted the importation of steel products (Central Bureau of Statistics, 2005).

Commodity Review

Metals

Aluminum.—PT Indonesia Asahan Aluminium (Inalum), which was the only aluminum smelter in Southeast Asia, planned to increase its output in the fiscal year between April 2004 and March 2005 to 234,000 metric tons (t). In the past several years, low water levels at Lake Toba in northern Sumatera, which was the main source of water for Inalum's hydroelectric powerplant, restricted power supply to the smelter. Owing to the shortage of electricity, the production of aluminum was well below its designed output capacity of 225,000 t. The smelter was owned by the 12-company Japanese consortium Nippon Asahan Aluminium Co. Ltd. (59%); the Government held the other 41%. Inalum exported 60% of its output to Japan; the rest went to the domestic market. Alumina was imported from Australia (Business Day, 2005§).

PT Aneka Tambang Tbk (PT Antam) completed all mandated studies for the Tayan chemical-grade alumina project in Tayan, West Kalimantan Province. The total investment of the project was estimated to be $220 million. PT Antam planned to fund 35% of the total from company equity. Japan Bank for International Cooperation will provide $143 million export credit. Initially, Japan's Alumina Chemical Co. expressed interested in joining the project but later withdraw its name from consideration. PT Antam planned to sign a joint-venture agreement with Malaysia Mining Corporation Bhd of Malaysia and Japan's Showa Denko Co. and Marubeni Corporation. The refinery was designed to produce 300,000 t of chemical-grade alumina from 800,000 t to 1.13 Mt of bauxite (Petrominer, 2004b).

Copper.—On October 9, 2003, a landslide at the southern part of Freeport's Grasberg Mine left eight people dead. Consequently, operations at the Grasberg Mine were suspended. On December 12, there was another landslide at the same location. The company decided to suspend all mining operations until the second quarter of 2004. Mining operations in 2004 were limited to work in the company's Deep Ore Zone underground mine and extraction of low-grade ore from the open pit. In 2004, average ore output was 185,000 metric tons per day (t/d), which was lower than the normal output of 230,000 t/d. In 2004, copper ore grades averaged 0.87% compared with 1.09% for 2003, and the recovery rate in 2004 was lower than that of 2003. The average grades of silver and gold were 3.85 grams per metric ton (g/t) and 0.88 g/t, respectively.

Freeport accelerated the removal of waste material and mined low-grade ore to restore safe access to higher grade ore areas and returned to normal milling rate in the second half of 2004. The company expected that the output of copper in concentrates would be higher with access to higher grade ore in 2005. Freeport continued to focus on the exploration of the Deep Mill Level Zone where a 146-Mt ore body with average grades of 1.22% copper and 0.95 g/t gold could be recovered. Freeport intended to resume exploration activities outside the existing producing area of the Grasberg mining district in 2005. The company planned to conduct feasibility studies on the development of the Big Gossan ore body, which contained 33 Mt of high-grade proven and probable ore reserves (Freeport-McMoRan Copper and Gold Inc., 2005).

Freeport McMoRan Copper and Gold Inc. of the United States informed the Indonesian Government that the company planned to merge Freeport and PT Indocopper Investama. Freeport McMoRan and Indocopper held 81.28% and 9.36%, respectively, of Freeport shares; the remaining shares were owned by the Indonesian Government. The merger was intended to reduce administrative and operational costs. After the merger, Freeport McMoRan will hold 90.64% of the Freeport shares, and the Indonesian Government, the remainder. During a special meeting in 2003, shareholders approved the merger. Under the CoW, the merger must be approved by the Indonesian Government. The Government wanted the company to divest its shares to local investors before the merger under the CoW. The Papua Provincial Government informed the Central Government that it planned to acquire 9.35% shares (about $700 million) of Freeport. The Ministries of Finance and Energy and Mineral Resources reviewed the request; the decision was to be announced in 2005 (Miningindo.com, 2004f§). Freeport planned to raise production capacity to 300,000 t/d of ore, which had been approved by the Government in 1997, from the current average production capacity of 230,000 t/d. Because of environmental concerns, the Commission VII of the Indonesian National Parliament urged Freeport reduce its production capacity. Freeport had no such intention (Miningindo.com, 2005b§).

PT Batutua Khanisma Permal (BKP) was waiting for the Maluku Tenggara Barat District government to issue a mining license to explore copper and barite in Kali Kuning and Lerokis on Wetar Island, Maluku Tenggara Barat District, Maluku. The Ministry of Energy and Mineral Resources terminated PT Prima Lirang Mining's gold operation activities in that area in October 2004. BKP wanted to study the arsenic content in copper rocks (Miningindo.com, 2004g§).

In 2004, owing to higher copper ore grades, production of copper from Indonesia's second-ranked copper- and gold-producing mine, Batu Hijau, which is located on Sumbawa Island, West Nusa Tenggara Province, increased by 13% to 325,881 t. Because of higher grades, gold output also increased. The mining and processing costs were lower but offset by increased treatment and refining charges and administrative costs. Because of higher metal prices, the net income of PT

Newmont Nusa Tenggara (NNT) increased in 2004 compared with that of 2003. The company applied to the Ministry of Environment for a 3-year extension of its submarine sea-tailing permit, which will expire in May 2005. Newmont Nusa Tenggara signed the fourth-generation CoW in December 1986. After 10 years of exploration, mining construction began in 1997 and was completed at the end of 1999. In December 2003, the ore reserve at the mine was 1 billion metric tons at grades of 0.525% copper and 0.37 g/t gold. The mining operation was expected to end in 2025. Exploration and drilling at satellite copper and gold prospects within the CoW zone, such as Elang, continued in 2004 (Newmont Mining Corporation, 2005; Miningindo.com, 2005c§).

Gold and Silver.—PT Newmont Minahasa Raya (NMR) suspended its operation in Minahasa, North Sulawesi Province, in August. Gold mining began in 1996 and because of depleted resources, mining operation ceased in October 2001. Since then, operation activity has been limited to process ore stocks. In 2004, villagers of Minahasa Regency complained that NMR polluted Buyat Bay. Water and fish were allegedly contaminated by NMR's tailings that were disposed of in Buyat Bay. This was being blamed for causing villagers to get sick. After long and exhaustive tests, the Government's technical team concluded that the arsenic and mercury contents at Buyat Bay were higher than standard levels and that the arsenic content in the drinking water and fish was a health risk to the people of Buyat Bay. The Indonesian Mining Association and NMR insisted that according to laboratory results from Japan's Minamata Institute and the World Health Organization, metal contents were within the safety standards. NMR and the residents at Buyat Bay signed an out-of-court compensation settlement in December (Petrominer, 2004c, d; Jakarta Post, The, 2004a§; Miningindo, 2004c§). The Ministry of Environment continued to pursue legal action against NMR in 2005 (Jakarta Post, The, 2005h§).

PT Newmont Horas Nauli (NHN) continued its exploration in Batang Toru, South Tapanuli, North Sumatera Province. The area was initially explored by PT Danau Toba Mining (Normandy) in 1997 under No. B.143/Pres/3/1997. In 2002, NHN acquired the CoW from Normany, and the Government approved it. The work areas are located in the regencies of Central Tapanuli, North Tapanuli, South Tapanuli, and Mandailing Natal and were collectively known as the Martabe Prospect. After 8 years of exploration, NHN discovered that the Ramba Joring and Tor Sipalpal areas contained at least 65 t of gold and 400 t of silver resources. The company planned to start mine construction in 2008 (Petrominer, 2005g).

The Ministry of Energy and Mineral Resources reversed the Ministry of Industry and Trade decision to impose a ban on silver exports. The purpose of the ban was to stimulate the domestic jewelry sector. Since the ban, silver producers' warehouses were stockpiled, and the domestic market could not absorb the amount of silver produced. Indonesia produced more than 250 t of silver but consumed only about 30 t in 2003. PT Kelian Equatorial Mining (KEM) and PT Nusa Halmahera Mineral were allowed to export their silver stocks (Department of Trade, 2004a, b).

Rio Tinto Ltd. decided to close down its gold and silver mining operation in Sangatta, East Kalimantan Province in February 2005. The mine had begun operation in 1992 and produced an average of 14 t/yr of gold and 10 t/yr of silver. KEM (Rio Tinto's subsidiary) will continue monitoring the mine closing program, which included reclamation, rehabilitation, and sustainable environment management. The area was expected to turn into a protected forest by 2013. KEM will provide training programs in agriculture and entrepreneurship for company employees and local people. The company will also assist local people in conducting mining activities around the mine site, which is considered to be uneconomical because gold content in the area is 1 to 1.5 grams per 2.3 t of ore (Miningindo, 2004d§).

In October, Avocet Mining PLC of United Kingdom began its gold mine, in North Lanut, North Sulawesi Province. Production was expected to be more than 155 kilograms per year for 5 years. The company planned to continue exploration work on the CoW area where the North Lanut mine is located (Avocet Mining PLC, 2004).

In March, fire broke out at the illegal miner tunnels adjacent to PT Antam's gold mine operation at Pongkor. There was no damage to the mine, but 1 PT Antam employee and 11 illegal miners died. Mining activities came to a halt for several weeks. PT Antam's gold output decreased by 11% to 3,715 kilograms (kg), which was lower than the company target of 4,175 kg. Silver output decreased by 3% (Miningindo.com, 2004b§).

Iron and Steel.—Indonesia produced less than 3 million metric tons per year (Mt/yr) of steel and consumed about 4 Mt/yr. Indonesia's only integrated steel producer, state-owned PT Krakatau Steel, planned to increase its steel output to 5 Mt/yr by 2008 to meet increasing domestic demand for hot-rolled coil, plate, and wire. Krakatau had the capacity to produce 1.9 Mt/yr of slab and 500,000 t/yr of billet from its direct-reduced iron and electric arc furnace processes. The company imported its iron ore pellet mainly from, in order of amount imported, Brazil, Chile, and Bahrain and considered sourcing pellets from Australia in its expansion plan. Krakatau signed an iron ore supply agreement with PT Antam in 2004. PT Antam's iron ore exported about 65% of its iron sand output to China, but the company decided to process its iron sand and to sell its concentrates to the domestic market in the future. Krakatau sold 75% of its steel output to local customers. Owing to increased domestic demand, Krakatau announced that it would export only 10% of its steel output in 2004 (Miningindo.com, 2004a§).

Lead and Zinc.—PT Dairi Prima Mineral (a 80-20 equity held by Herald Resources of Australia and PT Antam, respectively) completed its feasibility study on the Dairi project, which is located in the Dairi Regency, North Sumatera Province. The study was based upon mining of the high-grade Hanjing Hitam deposit, which is one of several resources in the area. The development plan was to construct a mine to produce 220,000 t/yr of concentrates that contained 120,000 t of zinc and 72,000 t of lead and was expected to take 15 months to build. The project was held under a seventh generation CoW. The Hanjing Hitam deposit had 6.6 Mt of ore at grades of 14.6% zinc, 8.8% lead, and 11 g/t silver (Herald Resources, 2005§).

Nickel.—Owing to increased demand, the supply of nickel continued to tighten in 2004 as China and the Republic of Korea expanded their stainless steel output capacities; as a result, the price of nickel in the world market rose by 54% at yearend.

Despite an increase in production costs, the net income of PT Antam and PT Inco increased sharply in 2004. In September 2004, PT Antam shut down its FeNi II smelter for a routine overhaul to upgrade the smelter's cooling system with the same new copper cooling system to be used in the FeNi III smelter; it was expected to resume operation in the second quarter of 2005. Production of nickel contained in ferronickel decreased by 11%. Nickel was mined at PT Antam's sites—Pomalaa, Southeast Sulawesi Province, and Gebe, Gee, and Tanjung Buli in North Maluku Province. Owing to depleted resources, Gebe was closed on November 29, 2004. The Mornopo Mine in North Maluku Province was expected to be put into operation in 2005 to replace Gebe. PT Antam planned to maintain a total output of about 3.5 Mt of saprolite and 1.2 Mt of limonite from its mines. The construction of the FeNi III smelter and the expansion of the Pomalaa ferronickel capacity to 26,000 t/yr from 11,000 t/yr were underway, and operations were expected to begin in the first quarter of 2006. The FeNi III smelter will use nickel ore feed from PT Antam's nickel deposits in Buli, North Baluku Province and from PT Inco's East Pomalaa deposit (PT Antam Tbk, 2005, p. 23).

As a result of lower rainfall in the fourth quarter and limited hydropower-generating capacity, PT Inco's output of nickel in matte was short of the company's target in 2004, although it reached the full output capacity. In December, the company operated only three of four furnaces. Owing to high fuel prices, production costs increased by 19% compared with those of 2003. PT Inco planned to invest a $250 million to increase its nickel-in-matte output capacity by 25% to 91,000 t/yr in Soroako, South Sulawesi Province, by 2009. The company intended to use $150 million to build a new dam at Karebbe on the Larona River to raise power-generating capacity by 33%, or 90 megawatts per year. PT Inco also planned to develop two nickel deposits, Bahodopi in Central Sulawesi Province and Pomalaa in Southeast Sulawesi Province. The company submitted its expansion plan for Government approval (PT International Nickel Indonesia Tbk, 2005).

Tin.—Indonesia was the second ranked tin-producing country in the world behind China. The Indonesian tin sector was dominated by two companies—PT Koba Tin and PT Tambang Timah Tbk (PT Timah). Low tin concentrates output from PT Timah was caused by the lack of dredge maintenance during 2002 and 2003 and the illegal miners who operated on the company's inland properties. Illegal miners sold their output to local tin smelters. Tin concentrates output from PT Timah decreased by 15% to 37,212 t in 2004, and refined tin output declined by 24% to 34,764 t. PT Timah exported about 95% of its output. The production cost per metric ton of refined tin increased by 74% because the higher purchase price of inland tin concentrates was offset by higher metal prices in the world market. In an effort to increase company value, PT Timah diversified its business into coal and silica sand production; tin, however, remained its core business. The company planned to allocate $2.2 million in offshore tin exploration in 2005 (PT Tambang Timah Tbk, 2005).

Under the regional autonomy law, the Bangka Belitung Regency government was allowed to issue operating licenses to locals to smelt tin and licenses to local companies to export tin. In 2004, 11 small tin smelters were in operation on Bangka Island and had a total output capacity of 41,200 t/yr of refined metal. The total output of refined tin in Indonesia could be higher than the reported Government figure. Apparently, the Government recorded output only from Koba Tin, which produced about 23,000 t in 2004, and PT Timah. These small smelters could not sell their products directly on the international market because they did not have brand names. The products, however, were exported to Singapore and Singapore-based traders resold the tin to major smelters in Malaysia and Thailand (Petrominer, 2004a).

Industrial Minerals

Cement.—The Indonesian cement sector was dominated by the following producers, in order of size: the PT Semen Gresik Group, which included PT Semen Padang and PT Semen Tonasa; PT Semen Cibinong; PT Indocement Tunggal Prakarsa; and PT Semen Andalas Indonesia. These producers accounted for 93% of the country's cement production. According to the Indonesia Cement Association, domestic demand for cement was 29.77 Mt in 2004, which was the same as the consumption level of 1997. The Indonesian population was concentrated mainly in Java. Of the domestic cement consumption, almost 62% was from Java; 21%, from Sumatera; 6%, from Sulawesi; 5%, from Kalimantan; and 6%, from other areas (Jakarta Post, The, 2005f§).

As Indonesia's economy slowly recovered, development activities, such as housing construction, improved. The Government estimated that investment in infrastructure, which included roads and ports, would be more than $150 billion. The demand for cement was expected to increase to 32.15 Mt in 2005 and 46.37 Mt in 2010. At yearend 2004, Indonesia had an installed capacity of 46 Mt/yr. To anticipate future demand for cement, 17 companies submitted proposals to build cement plants in Indonesia; the Government, however, might approve only those for PT Mega Bukit Barisan in North Sumatera Province, PT Balocci Makmur and PT Lebak Harapan Makmur in South Sulawesi Province, and PT Semen Batam in Riau Province (Coordinating Ministry for Economic Affairs, 2005; Jakarta Post, The, 2005g§).

The PT Semen Gresik Group planned to construct a 2.5-Mt/yr cement plant in the Sukabumi district of West Java Province or the Pacitan area in the south of East Java Province. PT Semen Padang had an installed capacity of 5.24 Mt/yr and used about 85%. The cost of the new plant was estimated to be $400 million, and construction would take 3 to 4 years to complete. About 30% of the investment would come from the company's cash reserves, and 70% would be from bank loans. The company also planned to invest about $40 million to increase output capacity by 1 Mt/yr in its East Java Province plant (Jakarta Post, The, 2005g§).

In 1998, through its subsidiary CEMEX Asia Holdings, Cementos Mexicanos, S.A. de C.V. (CEMEX) of Mexico signed a condition sale and purchase agreement with the Indonesia Government to buy 14% of Semen Gresik shares and had the right to buy additional shares until it became majority shareholder. CEMEX purchased an additional 11.5% shares in

Semen Gresik through stock exchange. The Government held 51% shares, and the public held the remainder. The deadline for the Government to implement the option was October 1, 2001. The local government and PT Semen Padang (a subsidiary of Semen Gresik) opposed the sale. The local government passed a decree that expropriated Semen Padang from Semen Gresik. The Government planned to buy back the Semen Gresik shares from CEMEX, but CEMEX did not want to sell. In December, CEMEX filed a dispute agreement with the International Center for the Settlement of Investment Disputes for the Indonesian Government to pay damages for not upholding its contractual obligations (Jakarta Post, The, 2005a§).

Mineral Fuels

Coal.—As a result of rising coal demand and high coal prices, Indonesian coal output increased by 15% to 132.3 Mt in 2004 compared with that of 2003. Owing to increased demand for coal in Asia, coal output was expected to increase to 150 Mt in 2005. As the coal price rose on the international markets and China's Government restricted coal exports, Indonesia's coal producers increased their coal exports by more than 9% to 93.8 Mt in 2004. Regional exports within Asia accounted for 75% of the total. Japan and Taiwan remained the leading destinations, followed by the Republic of Korea, Hong Kong, and Malaysia. Domestic coal demand increased to 36.1 Mt in 2004. Powerplants, which were the leading consumers, accounted for 63% of the total demand, and cement plants consumed about 15% of the total. During the next couple of years, several coal-fired powerplants in Central Java and West Java Provinces were scheduled to begin operations. The Government planned to reduce the consumption of oil to 30% in 2025. The amount of coal and gas used in powerplants will increase to 60%; 10% will be from other sources. Coal demand in Indonesia was expected to increase to 47.7 Mt in 2010 and to reach 72 Mt in 2020. The Government was considering the imposition of higher export tariffs on coal and gas or providing incentives for domestic suppliers to sell their output on the domestic market (U.S. Embassy Jakarta Indonesia, 2005a; Jakarta Post, The, 2005c§).

Natural Gas and Petroleum.—In 2004, Indonesia produced an average of 1.095 million barrels per day (Mbbl/d); this was a decline of the average of 1.146 Mbbl/d produced in 2003 and was also lower than the Government's target of 1.25 Mbbl/d. It was the 11th consecutive year that oil output declined. PT Caltex Pacific Indonesia, China National Offshore Oil Co., Medco Energi International TBK's PT Exspan Nusantara, PT Pertamina, and PetroChina Co. Ltd. were the leading oil producers. Aging oilfields, lower exploration investment, and regulation and policy uncertainties were the main reasons for the decline of oil production. Major international oil companies have reduced their drilling expenditures during the past several years. The Government set the oil production target at 1.125 Mbbl/d for 2005, which was lower than the quota of 1.4 Mbbl/d set by the Organization of the Petroleum Exporting Countries (U.S. Embassy Jakarta, Indonesia, 2005b).

In 2004, total exports of Indonesia's crude oil was down to about 30,000 barrels per day (bbl/d), or about one-third that of 2003. In an attempt to increase oil production, the Government planned to provide incentives to investors to operate in marginal and aging oilfields. There were 66 marginal fields that produced between 5,000 and 10,000 bbl/d. The Government also considered increasing the operators' share of revenue in such fields from the usual proportions of 85% of shares for the Government and 15% for the operator. The Government planned to increase the oil production target to 1.3 Mbbl/d in 2008. The additional output of crude and condense could come from the Cepu and Jeruk Oilfields in East Java Province. Because of the dispute between state-owned Pertamina and Exxon Mobil Corp. of the United States, the drilling at the Cepu Oilfield was halted because of the dispute. ExxonMobil, which held the concession rights to operate in the area, tried to extend its contract, which expires in 2010, but Pertamina refused (Jakarta Post, The, 2005b§; Miningindo, 2005d§).

Indonesia's natural gas output decreased to 82.74 billion cubic meters in 2004, and the output of liquefied natural gas (LNG) dropped to 25.5 Mt. Indonesia's two production centers were located at Arun in Aceh Province and Bontang in East Kalimantan Province. ExxonMobil supplied natural gas from its onshore and offshore fields for LNG at Arun, which had production capacity of 12.8 Mt/yr. The supply of natural gas for the Bontang LNG plant came from Total S.A. of France, VICO Indonesia (a British-Italian joint venture), and Unocal Corp. of the United States. The eight-train facility had a total capacity of 21.63 Mt/yr. A third LNG production center at Tangguh in western Papua Province, which is operated by a BP Corp.-led consortium, will come online in 2008, but under the contracts, Indonesia will supply 6.3 Mt/yr of LNG to China and the United States in 2007. Of Indonesia total LNG exports, 71% went to Japan; 20%, to the Republic of Korea; and 9%, to Taiwan, (U.S. Embassy Jakarta, Indonesia, 2005c).

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TABLE 1
INDONESIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS						
Aluminum:						
Bauxite, wet basis, gross weight	thousand metric tons	1,151	1,237	1,283	1,263	1,331
Metal, primary[e]		160,000	180,000	160,000	200,000 [r]	230,000
Chromite sand, dry basis[e]		1,000	1,000	1,000	1,000	1,000
Copper:						
Mine, Cu content		1,012,054	1,048,694	1,171,726	1,005,837	840,318
Metal						
Smelter, primary		173,800	217,500	211,200	247,400	211,600
Refinery, primary		158,400	212,500	192,400	223,300	210,500
Gold, mine output, Au content[2]	kilograms	123,994	162,605	142,238	141,019	92,936
Iron and steel:						
Iron sand, dry basis		489,126	469,132	378,376	245,409	89,664
Metal:						
Ferroalloys:						
Ferronickel		47,749	47,769	42,306	43,894	39,538
Ferromanganese[e]		12,000	12,000	12,000	12,000	12,000
Pig iron, direct reduced iron	thousand metric tons	1,820	1,480	1,500	1,230	1,470
Steel, crude[e]	do.	2,850	2,780	2,460	2,040	2,800
Nickel:						
Mine output, Ni content[3]		98,200	102,000	123,000	143,000	133,000
Matte, Ni content		59,200	63,471	59,500	70,200	68,576
Ferronickel, Ni content		10,111	10,302	8,807	8,933	7,945
Silver, mine output, Ag content	kilograms	255,578	269,825	293,520	285,206	262,935
Tin:						
Mine output, Sn content		55,624	61,863	88,142	71,694	65,772
Metal		47,129	53,796	67,455	66,284	49,872
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	27,789	31,100	34,640 [r]	35,500	36,000 [e]
Clays:[e]						
Bentonite		5,000	5,000	5,000	5,000	5,000
Fire clay	thousand metric tons	1,900	1,900	1,900	1,900	1,900
Kaolin powder		15,000	15,000	15,000	15,000	15,000
Diamond:[e]						
Industrial stones	thousand carats	23	23	23	23	23
Gem-quality stones	do.	7	7	7	7	7
Total	do.	30	30	30	30	30
Feldspar[e]		24,000	24,000	24,000	24,000	24,000
Gypsum[e]		6,000	6,000	6,000	6,000	6,000
Iodine[e]		75	75	75	75	75
Nitrogen, N content of ammonia	thousand metric tons	3,617	3,665	4,200	4,250	4,120
Phosphate rock[e]		630	600	600	600	600
Salt, all types[e]	thousand metric tons	650	680	680	680	680
Stone:						
Dolomite[e]		3,500	3,000	3,100	3,100	3,100
Granite	thousand metric tons	5,941	3,975	4,966	3,939	3,637
Limestone[e]	cubic meters	16,000 [4]	16,000	16,500	16,000	16,000
Marble[e]	do.	1,000	1,000	1,000	1,000	1,000
Quartz sand and silica stone[e]	do.	145,000	145,000	145,000	150,000	150,000
Sulfur, elemental[e]		63,500 [r]	68,500 [r]	73,500 [r]	78,500 [r]	83,500
Zeolite[e]		400	400	400	400	400

See footnotes at end of table.

TABLE 1—Continued
INDONESIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite		25,000	40,807	42,690	50,000 [e]	50,000 [e]
Bituminous	thousand metric tons	77,015	92,500	103,329	114,000 [e]	132,000 [e]
Gas, natural:						
Gross	million cubic meters	82,334	79,470	85,959	89,324	83,740
Marketed[e]	do.	45,100	44,000	51,000	54,000	52,000
Petroleum, crude, including condensate	thousand 42-gallon barrels	516,070	489,460	432,000	413,000	362,000

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised.

[1] Table includes data available through August 12, 2005.

[2] Includes gold content of copper ore and output by Government-controlled foreign contractors' operations. Gold output by operators of so-called people's mines and illegal small-scale mines is not available but may be as much as 20 metric tons per year.

[3] Includes a small amount of cobalt that was not recovered separately.

[4] Reported figure.

TABLE 2
INDONESIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Locations of main facilities	Annual capacity[e]
Aluminum:			
Bauxite	PT Aneka Tambang Tbk (Government, 65%)	Kijang, Bintan Island, Riau	1,300
Metal	PT Indonesia Asahan Aluminum (Nippon Asahan Aluminum Co. Ltd., 59%, and Government, 41%)	Kual Tanjun, North Sumatera	250
Cement	PT Indocement Tunggal Prakarsa	Cirebon and Citeureup, West Java; Tarjun, South Kalimantan	15,600
Do.	PT Semen Andalas Indonesia	Aceh Besar	1,400
Do.	PT Semen Baturaja (Persero)	Baturaja-Ogan Komering Ulu, South Sumatera	1,250
Do.	PT Semen Bosowa Maros	Kabupaten Maros, Sulawesi Selatan	1,800
Do.	PT Semen Cibinong	Narogong, East Java	9,700
Do.	PT Semen Gresik (Persero)	Gresik and Tubar, East Java	7,500
Do.	PT Semen Padang (Persero)	West Sumatera	5,240
Do.	PT Semen Tonasa (Persero)	Pangkep, Sulawesi Selatan	3,450
Coal	PT Adaro Indonesia (New Hope Corp, 50%; PT Asminco Bara Utama, 40%; Mission Energy, 10%)	Paringin and Tutupan, South Kalimantan	22,000
Do.	PT Arutmin Indonesia (PT Bumi Resources Tbk, 80%, and Bakrie Group, 20%)	Mulia, Senakin, and Satui, South Kalimantan	11,000
Do.	PT Berau Coal (PT United Tractor, 60%; PT Armadian, 30%; Nissho Iwai, 10%)	Berau, East Kalimantan	13,000
Do.	PT Kaltim Prima Coal Co. (PT Rio Tinto Indonesia and BP Amoco, plc, 49%; Government of East Kutai Regency, 31%; PT Tambang Batubara Bukit Asam, 20%)	Samarinda, East Kalimantan	18,000
Do.	PT Kideco Jaya Agung (Samtan Co. Ltd., 100%)	Pasir, East Kalimantan	12,000
Do.	PT Tambang Batubara Bukit Asam (state-owned)	Tanjung Enim and Ombilin, South Sumatera	19,000
Copper:			
Concentrate	PT Freeport Indonesia Co. (Freeport-McMoRan Copper and Gold Inc., 81.28%; Government, 9.36%; others, 9.36%)	Ertsberg and Grasberg, Papua	800
Do.	PT Newmont Nusa Tenggara (Newmont Gold Mining Co., 45%; Sumitomo Corp., 35%; PT Pukuafu Indah, 20%)	Sumbawa Island, West Nusa Tenggara	300
Metal	PT Smelting Co. (Mitsubishi Materials Corp., 60.5%; PT Freeport Indonesia Co., 25%; others, 14.5%)	Gresik, East Java	210

See footnote at end of table.

TABLE 2—Continued
INDONESIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Locations of main facilities	Annual capacity^e
Gas:				
Natural	millon cubic feet per day	ExxonMobil Oil Indonesia	Arun and Aceh, North Sumatera	1,700
Do.	do.	Roy M. Huffington (subsidiary of HUFFCO Group)	Badak, East Kalimantan	1,000
Do.	do.	Total Indonesie	Offshore East Kalimantan	2,100
Liquefied	do.	PT Arun LNG Co. Ltd. (Government, 55%; Mobil Oil Corp., 30%; Japan Indonesia LNG Co., 15%)	Balang Lancang amd Aceh, North Sumatera	10,000
Do.	do.	PT Badak LNG Co. Ltd. (Government, 55%; HUFFCO Group, 30%; Japan Indonesia LNG Co., 15%)	Bontang, East Kalimantan	7,900
Gold	metric tons	Aurora Gold Ltd. (100%)	Balikpapan, Central Kalimantan	60
Do.	do.	PT Aneka Tambang Tbk (Government, 65%)	Bogor, West Java	3
Do.	do.	PT Freeport Indonesia Co. (Freeport-McMoRan Copper and Gold Inc., 81.28%; Government, 9.36%; others, 9.36%)	Ertsberg and Grasberg, Papua	110
Do.	do.	PT Newmont Nusa Tenggara (Newmont Gold Mining Co., 45%; Sumitomo Corp., 35%; PT Pukuafu Indah, 20%)	Sumbawa Island, West Nusa Tenggara	16
Do.	do.	PT Nusa Halmahera (PT Aneka Tambang Tbk, 17.5%, and PT Newcrest Mining Ltd. 82.5%)	Halmahera Isand, Maluku	24
Do.	do.	PT Prima Lirang Mining (Billiton BV, 90%, and PT Prima Maluku Maluku Indah, 10%)	Lerokis, Wetar Island	3
Nickel:				
In ore		PT Aneka Tambang Tbk (Government, 65%)	Pomalaa, South Sulawesi, and on Gebe Island	80
Do.		PT International Nickel Indonesia Tbk (Inco Ltd., 59%; Sumitomo Metal Mining Co. Ltd., 20%; others, 21%)	Soroako, South Sulawesi	70
In matte		PT Aneka Tambang Tbk (Government, 65%)	Pomalaa, South Sulawesi	24
Do.		PT International Nickel Indonesia Tbk (Inco Ltd., 59%; Sumitomo Metal Mining Co. Ltd., 20%; others, 21%)	Soroako, South Sulawesi	68
Nitrogen		PT Aseah-Aech Fertilizer (Government, 60%, and other members of the Association of Southeast Asian Nations, 40%)	Lhokseumawe, North Sumatera	506
Do.		PT Pupuk Iskandar Muda (Government, 100%)	do.	506
Do.		PT Pupuk Kalimantan Timur (Government, 100%)	Bontang, East Kalimantan	1,010
Do.		PT Pupuk Sriwijawa (Government, 100%)	Palembang, South Sumatera	1,440
Petroleum, crude	thousand 42-gallon barrels per day	Atlantic Richfield Indonesia, Inc. (subsidiary of Arco Co.)	Arjuna and Arimbi, offshore West Java	170
Do.	do.	Maxus Southeast Asia Ltd. (subsidiary of Maxus Energy Corp.)	Cinta and Rama, offshore Southeast Sumatera	95
Do.	do.	Pertamina (Government, 100%)	Jatibarang, West Java, and Bunyu, offshore East Kalimantan	80
Do.	do.	PT Caltex Pacific Indonesia (Texaco Inc., 50%, and Chevron Corp., 50%)	Minas, Duri, and Bangko, central Sumatera	700
Do.	do.	Total Indonesie (subsidiary of Compagnie Francaise des Petroles)	Handi and Bakapai onshore and offshore East Kalimantan	180
Steel, crude		PT Ispat Indo	Sidoarjo, Surabaya	700
Do.		PT Krakatau Steel (Government, 100%)	Cilegon, West Java	2,400
Do.		PT Komatsu Indonesia Tbk	Jakarta	8
Do.		PT Wahana Garuda Lestari	Pulogadung, Jakarta	410
Tin:				
In ore		PT Koba Tin (Malaysia Smelting Corp., 75%, and PT Tambang Timah Tbk, 25%)	Koba, Bangka Island	25
Do.		PT Tambang Timah Tbk (Government, 65%)	Onshore and offshore islands of Bangka, Belitung, and Singkep	60
Metal		Mentok Tin Smelter (PT Tambang Timah Tbk)	Mentok, Bangka Island, South Sumatera	68
Do.		Koba Tin Smelter (PT Koba Tin)	Koba, Bangka Island, South Sumatera	25

^{e}Estimated; estimated data are rounded to no more than three significant digits.

THE MINERAL INDUSTRY OF JAPAN

By John C. Wu

Japan is located in East Asia between the North Pacific Ocean and the Sea of Japan (East Sea), east of the Korean Peninsula. The country's total area is 377,835 square kilometers, and its population as of October 1, 2004, was estimated to be 127.7 million. Japan was one of the most highly industrialized and technologically advanced countries in the world. Its economy ranked second in the world with a gross domestic product (GDP) of $4.7 trillion ($3.8 trillion based on purchasing power parity); its per capita GDP was $36,574 ($29,906 based on purchasing power parity) in 2004 (International Monetary Fund, 2005§[1]; Ministry of Internal Affairs and Communications, 2005§).

Japan has limited indigenous mineral resources and relied heavily on imports of mineral fuels and a wide variety of nonfuel minerals and mineral products to meet the raw material requirements of its large manufacturing and utility (electricity and gas) sectors. The country, however, has substantial indigenous mineral resources of such industrial minerals as dolomite, iodine, limestone, pyrophyllite, and silica (table 3).

The production capacities of Japan's chemical, construction material, electricity, and ferrous and nonferrous metals industries in the manufacturing and utility sectors were among the largest in the world. These industries in the manufacturing sector processed imported raw materials and produced a broad category of mineral products, which included chemical compounds, construction materials, ferrous metals, fertilizer materials, industrial minerals, inorganic chemicals, nonferrous metals, petrochemicals, and refined petroleum products for domestic consumption by downstream industries in the manufacturing and construction sectors and for export to the world markets. The electricity and gas industries used imported coal, natural gas, petroleum, and uranium and other nuclear fuel materials to produce electricity and processed natural gas to meet the energy requirements for the construction, manufacturing, mining, and other sectors of the economy.

In 2004, Japan was one of the world's top importers and consumers of primary aluminum, cadmium metal, coal, cobalt metal, copper ore and metal, diamond, ferrochromium, ferronickel, fluorspar, gallium metal, gold metal, iron ore, ilmenite and rutile, indium metal, lead ore and metal, lithium metal, manganese ore and metal, magnesium, liquefied natural gas (LNG), nickel ore and metal, crude petroleum, platinum-group metals, phosphate rock, potash, rare earths, industrial salt, silicon metal, silver metal, tungsten ore, tin metal, zinc ore and metal, and zircon. Japan was one of the world's major exporters of cement, refined copper, inorganic chemicals, compound fertilizers, iodine, electrolytic manganese dioxide (EMD), high-purity rare (minor) metals, iron and steel, and titanium sponge metal and titanium mill products.

The mining sector was the smallest sector of Japan's industry-based economy. According to the Government statistics on the GDP at constant prices classified by economic activities of Japan's national accounts, the percentage contribution of the mining sector to Japan's GDP was only 0.2% in 2003 (the latest year for which data were available). The percentage contribution to Japan's GDP by the mineral industry, which included processing industries of chemicals (2.0%), petroleum and coal products (1.1%), iron and steel (1.0%), fabricated metal products (0.9%), industrial mineral products (0.7%), and nonferrous metals (0.4%), and the mining (0.2%) industry, however, was 6.3% (Economic and Social Research Institute, 2005b§).

The mineral industry was important to the Japanese economy because of its contribution to the GDP and the vital role it played in supplying primary materials not only to its own construction and manufacturing sectors, but also to those in China, the Republic of Korea, and Taiwan in northeast Asia and to such members of the Association of Southeast Asian Nations (ASEAN) as Brunei, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam.

The Japanese economy, as measured by real GDP in 2000 constant prices, grew by 1.9% in fiscal year 2004 (from April 2004 to March 2005) following a positive growth of 2.0% (revised) in fiscal year 2003. Japan's real GDP growth in calendar year 2004 was estimated to be 2.7% compared with 1.4% in calendar year 2003. The higher growth in 2004 was largely owing to a 2.6% growth in private demand as a result of increased private nonresidential (plant and equipment) investment and increased exports of goods and services (Economic and Social Research Institute, 2005a§).

In 2004, Japan's industrial production, as measured by the indices of mining and manufacturing, increased by 5.6% compared with 3.3% in 2003. The number of unemployed workers in Japan decreased to 3.2 million from 3.5 million in 2003, and the total labor force decreased to 66.4 million from 66.67 million in 2003. As a result, the unemployment rate in Japan decreased to 4.7% from 5.3% in 2003. Japan's merchandise trade surplus rose to $110.5 billion from $87.9 billion in 2003. The Japanese yen appreciated by 7.2% to ¥108.17 against $1.00 in 2004. As measured by the consumer price index, Japan's rate of change in the consumer price index was unchanged in 2003 compared with the rate of deflation of 0.3% in 2003 (Japan Institute for Labor Policy and Training, 2005§).

Government Policies and Programs

To secure stable and efficient supply of mineral resources, Japan promoted exploration and development of minerals overseas and encouraged domestic metals recycling.

The Metal Mining Agency of Japan (MMAJ) and the state-owned Japan National Oil Corp. (JNOC) merged in February 2004.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

As a result, the new Government organization under the supervision of the Ministry of Economy, Trade, and Industry (METI), which is called Japan Oil, Gas and Metals National Corp. (JOGMEC), was established with the objective of securing a stable supply of oil, gas, and nonferrous metals to Japan. To achieve this objective, JOGMEC would provide assistance by offering its knowledge, information, and technological expertise to support Japanese companies at various stages between the acquisition of exploration and production rights and production; would assume responsibility for the management of the national stockpile of crude oil, liquefied petroleum gas (LPG), and rare metals; and would support activities to control mine pollution. According to JOGMEC, the 2004 budget for metals-related activities (excluding oil and gas) totaled about $75 million with a staff of about 200 professionals; 35 of those were geologists. JOGMEC's metals-related activities included providing mineral resources information services, conducting domestic and overseas geologic surveys, financing domestic and overseas mineral exploration and development projects, supporting technology development projects, stockpiling rare metals (chromium, cobalt, manganese, molybdenum, nickel, tungsten, and vanadium), conducting mine pollution control activities, and cooperating with developing countries on economic growth (Japan Oil, Gas and Metals National Corp., 2004).

To contribute to a stable supply of mineral resources to Japan and to accelerate mineral production and economic growth in developing countries, the former MMAJ started a new mineral exploration program, which is called the Joint Basic Exploration Scheme (JBES), with a $5 million budget in fiscal year 2003. JOGMEC continued the JBES program and increased its annual budget to $8 million in fiscal year 2004 and was expected to increase its annual budget to $11 million in fiscal year 2005. According to JOGMEC. the overseas mineral exploration projects implemented by the former MMAJ as part of the Development Assistance Program were completed in 2004 (Japan Oil, Gas and Metals National Corp., 2005a).

The JBES-targeted commodities were, in order of priority, copper, zinc, nickel, platinum-group metals, and rare metals, which included cobalt, chromium, manganese, rare earths, tantalum, titanium, and tungsten. The potential joint-venture partners of the JBES included state-owned mineral enterprises; regional government organizations; local geological survey agencies; and private, multinational major, and junior mining companies that hold exploration licenses and have the power to sign and carry out the JBES contract terms. A typical JBES agreement includes minimum work and expenditure commitment and farm-in arrangements for projects that are intended to last from 1 to 5 years. Regarding JOGMEC's interest acquired through the joint-venture exploration, JOGMEC and its partner need to agree to a condition that JOGMEC may transfer its interest to a proper successor after completion of the project period. As of 2004, JOGMEC's ongoing 10 JBES projects included 2 in Argentina to explore for copper; 2 in Brazil, for copper and nickel; 2 in Chile, for copper; 2 in Indonesia, for copper and zinc; and 2 in Mongolia, for copper. According to JOGMEC, one project in Mexico was still under negotiation in 2004, and most of the ongoing projects were joint ventures with private mining companies. JOGMEC's JBES budget originated from the METI; a typical annual budget for a JBES project was between $100,000 and $1 million. Operation and management of each JBES project budget must conform to the Japanese fiscal year (Japan Oil, Gas and Metals National Corp., 2004).

Environmental Issues

Japan stopped mining asbestos in 2002. A total ban on asbestos was announced in 2002 following many years of sporadic and variably effective measures intended to control its use. Asbestos-related illness made headlines in 1982 when a local press published a hospital study which concluded that about one-third of 848 deaths over 5 years in Yokosuka in Kanagawa Prefecture were caused by asbestos-related lung cancer. Yokosuka has long been the site of a U.S. naval base and the shipbuilding industry. Following the discovery that asbestos from a decommissioned U.S. Navy ship had been dumped by a roadside, public awareness grew and made asbestos a major issue of concern across Japan (Furuya, Natori, and Ikeda, 2003).

To response to the situation, the Ministry of Health, Labor and Welfare announced in June 2002 that the Government would introduce a total ban on chrysotile asbestos. As to when and how the ban would be implemented was not determined. In 2003, a report of the Technical Committee on Substitute for Asbestos was released followed by the hearing from the Asbestos Institute and Canadian Government (Canada was a major asbestos supplier to Japan) and the public comments on the ban. After the deliberation of the Labor Policy Council in September 2003, the amended Enforcement Order of Industrial Safety and Health Law (ISHL) was proclaimed in October 2003 and was enforced beginning on October 1, 2004. According to the Amended ISHL of 2003, the manufacture, import, use, and transfer of the 10 main products that contain greater than 1% asbestos, by weight, were prohibited. These 10 products were adhesives, asbestos cement pipes, brake linings, brake pads, clutch facings, clutch lining, decorated cement shingles for dwelling roofs, extruded cement panels, fiber-reinforced boards, and fiber-reinforced cement sidings. According to the Amended Order, all other asbestos products were not prohibited. All other asbestos products included the 10 prohibited products, provided they contain 1% or less asbestos by weight or were produced or imported before October 1, 2004, and asbestos fiber (Kazuko, 2004§).

Production

Mine production of all nonferrous metals (except zinc) and most industrial minerals (except bentonite, dolomite, gypsum, iodine, and kaolin) declined in 2004 because of depleting ore reserves. Mine production of zinc increased because of higher ore production from the Toyoha Mine in Hokkaido Prefecture. Limestone production declined mainly because of decreased consumption for the manufacturing of cement and construction aggregate and for road construction. Japan's coal output remained at about the same level as that of 2003. In 2004, 11 small-scale open pit coal mines and 1 major underground coal mine operated in the Prefectures of Hokkaido and Yamaguchi.

The output of crude petroleum and natural gas continued to increase in 2004 but remained insignificant when compared with Japan's requirements.

In the mineral-processing industry, production of most nonferrous metals, such as refined copper, gold, lead, nickel, tin, titanium, and zinc, increased owing to the continued economic growth and higher demand for metals in the domestic and Asian markets in 2004. Production of crude steel reached the highest level since 1974 owing mainly to the stronger domestic demand for automobiles, machinery and equipment, and shipbuilding industries and the continued high level of exports to China, the Republic of Korea, Taiwan, and Thailand. Production of titanium sponge metal increased sharply in 2004 mainly owing to increased domestic demand and increased exports to the European Union (EU). Production of cement and other construction-related materials was slightly lower because of the continued cutbacks in public works projects in 2004. Production of refined petroleum products was mostly lower in 2004 because of decreased domestic demand for kerosene, LPG, and residual fuel oil (table 1).

Trade

Japan remained a net importer of minerals mainly owing to its large imports of mineral fuels. Japan's mineral trade deficit increased to $98.6 billion in 2004 from $78.8 billion in 2003 as a result of a 22.7% increase in import bills for mineral fuels and increases in import bills for all other minerals and mineral products and despite higher export earnings from iron and steel products and all other minerals and mineral products in 2004 (table 4).

Total imports of minerals increased by 26.4% to $148.3 billion and accounted for 32.6% of the total imports, which were valued at $454.9 billion in 2004. The higher import bill for minerals was a combination of higher import volume and price. Of the total minerals imports, $99.4 billion was for such mineral fuels as coal, LNG, crude petroleum, partially refined petroleum, refined petroleum products, and other mineral fuels; $10.2 billion, for ores and concentrates of iron and steel and nonferrous metals, slag, scrap, and ash of iron and steel, other metals, and metal compounds; and $1.4 billion, for such industrial minerals as cement, earths and stone, lime, plastering materials, salt, and sulfur. Imports of processed minerals, mineral-related chemicals, and metals totaled $37.3 billion, of which $20.8 billion was for products of iron and steel and nonferrous, rare, and other base metals; $7.7 billion, for precious and semiprecious stones and precious metals; $5.0 billion, for mineral-related chemicals and fertilizers; and $3.8 billion, for articles and products of asbestos, cement, ceramics, glass, mica, and stone (Ministry of Finance, 2004b, p. 9-13, 15-16, 34-41).

Total exports of minerals, mineral-related chemicals, and processed mineral products increased by 29.1% to $49.7 billion and accounted for 8.8% of Japan's total exports, which were valued at $565.3 billion in 2004. Exports of iron and steel products and nonferrous, rare, and other base metals totaled $35.9 billion. Exports of processed mineral articles and products of asbestos, cement, ceramics, glass, mica, and stone amounted to $5.8 billion. Exports of cement, earths and stone, mineral fuels, lime, ferrous and nonferrous metal ores, plastering materials, salt, and sulfur were $2.8 billion. Exports of mineral-related chemicals and fertilizer were $2.8 billion. Exports of precious and semiprecious stones and precious metals were $2.5 billion (Ministry of Finance, 2004a, p. 9-13, 15-16, 34-41).

Structure of the Mineral Industry

Japan's mineral industry consisted of a small mining sector of coal and nonferrous metals, a large mining sector of industrial minerals, and a large mineral-processing sector of ferrous and nonferrous metals and industrial minerals (table 2). Mining and mineral-processing businesses were owned and operated by private companies incorporated in Japan.

In the mining sector, the number of major nonferrous metal mines remained at two in 2004. The major industrial mineral mines (mostly limestone quarries) totaled about 40 in 2004. The coal mining sector consisted of nine small-scale open pit mines and one major underground mine (Kushiro) in Hokkaido Prefecture and one small-scale open pit coal mine at Mine, Yamaguchi Prefecture on Honshu.

Japan's mining capacity of nonferrous and precious metals (mainly gold, lead, silver, and zinc) and coal decreased substantially during the year. The number of persons employed by the mining sector dropped to 40,000 in 2004 from 50,000 in 2003 (Statistical Handbook of Japan, 2005§).

In the mineral-processing sector, the iron and steel industry continued to cut the number of employees to 154,578 from 155,325 at the end of 2003. The industry's production capacity of pig iron decreased to 82.00 million metric tons per year (Mt/yr) from 84.38 Mt/yr in 2003, but the production capacity of crude steel increased slightly to 120.79 Mt/yr from 120.53 Mt/yr at the end of 2003. In the nonferrous metals industry, which included smelting and refining of copper, gold, lead, silver, zinc, and other minor metals, the number of regular employees was reduced to 5,148 from 5,572 at the end of 2003. In 2004, Japan's production capacity of refined copper remained at 1.5 Mt/yr; refined gold increased to 186.0 metric tons per year (t/yr) from 182.4 t/yr at the end of 2003; refined lead remained at 275,000 t/yr; refined silver decreased to 2,800 t/yr from 2,980 t/yr at the end of 2003; and refined zinc remained at 750,000 t/yr. Because of the strong demand for titanium sponge metal in late 2004, Toho Titanium Co. Ltd. announced in November 2004 that its capacity would be increased by 7.7% to 14,000 t/yr by February 2005 (Yahoo.com, 2004§). Japan's cement industry cut the number of its regular employees by 311 to 3,349 and reduced its cement clinker capacity by 6.5% to 76.0 Mt/yr from 81.4 Mt/yr at the end of 2004 (Ministry of Economy, Trade and Industry, 2004a, p. 143, 145; 2004c, p. 107-108, 160, 162).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Japan relied 100% on imports of bauxite for the production of alumina and aluminum hydroxide. In 2004, imports of bauxite decreased by 3% to 1.95 million metric tons (Mt) valued at $70.8 million. The major supplying countries of bauxite in 2004 were Australia (53.5%), Indonesia (35.5%), and India (8.2%). Production of alumina and aluminum hydroxide was by Nippon Light Metal Co. Ltd. (NLM) at its Shimizu plant in Shizuoka Prefecture with a capacity to produce 365,000 t/yr of aluminum hydroxide and 163,000 t/yr of alumina, Showa Denko K.K. at its Yokohama plant in Kanagawa Prefecture with a capacity to produce 220,000 t/yr of aluminum hydroxide and 105,000 t/yr of alumina, and Sumitomo Chemical Co. Ltd. at its Ehime plant in Ehime Prefecture with a capacity to produce 200,000 t/yr of aluminum hydroxide and 105,000 t/yr of alumina (Japan Aluminum Association, 2003, p. 11).

Production of primary aluminum (unwrought aluminum) by NLM at the Kambara smelter in Shizuoka Prefecture was insignificant. Virtually all Japan's requirements for primary aluminum were met by imports. In 2004, imports of primary aluminum increased by 2.7% to more than 3 Mt valued at $5.25 billion, of which 2.05 Mt was ingot and 971,488 metric tons (t), alloys (Ministry of Finance, 2004b, p. 668-669).

Of the total primary aluminum imports, about 45% was supplied from Japan's 11 overseas aluminum smelter projects; Japanese aluminum and major trading companies held substantial equity shares in those smelters in Australia, Brazil, Canada, Indonesia, Mozambique, New Zealand, the United States, and Venezuela (table 5). In 2004, Japan diversified its import sources of primary aluminum and aluminum alloy into 52 countries worldwide Among the 52 countries, the major suppliers were Russia (25.6%), Australia (18.3%), China (10.7%), New Zealand (7.5%), Brazil (7.1%), South Africa (6.9%), Canada (5.3%), Indonesia (4.6%), and Venezuela (2.4%). The United States supplied only 6,913 t and accounted for only 0.2% of Japan's imports of primary aluminum and aluminum alloys in 2004 (Ministry of Finance, 2004b, p. 668-669).

Consumption of primary aluminum was estimated to be 2 Mt in 2004 of which about 1.8 Mt was for aluminum rolled products. Exports of primary aluminum, which included aluminum ingots (18,923 t) and aluminum alloys (17,379 t), totaled 36,302 t valued at $82.5 million in 2004. The major buyers of aluminum ingot were Thailand (83.3%), China (8.1%), Vietnam (3.0%), and the Philippines (2.5%). The major buyers of aluminum alloys were the Republic of Korea (34.0%), Indonesia (12.1%), Thailand (11.2%), and China (10.4%) (Ministry of Finance, 2004a, p. 577-578).

Overall demand for aluminum mill products was estimated to be about 4.1 Mt in 2004. According to the Japan Aluminum Association, demand for aluminum mill products by end-use market in 2004 was 38.3% for transportation, 17.4% for building and construction, 12.9% for fabricated metal, 11.4% for food, 4.3% for communication machinery, 4.2% for industrial machinery, and 11.5% for others (Japan Aluminum Association, 2005§).

Cadmium.—In 2004, Japan was the world's second ranked producer after the Republic of Korea and the world's leading consumer of cadmium. Cadmium was produced mainly as a byproduct of zinc-refining operations that used mostly ore imported from Australia, Canada, Peru, and the United States. In 2004, cadmium was produced by Toho Zinc Co. Ltd. (667 t); Zinc Excel Co. Ltd. (561 t), which was a joint-venture company of Dowa Mining Co. Ltd. and Mitsubishi Materials Corp.; Sumitomo Metal Mining Co. Ltd. (451 t); Nippon Mining & Metals Co. Ltd. (256 t); and Mitsui Mining & Smelting Co. Ltd. (225 t) (Arumu Publishing Co. Ltd., 2005, p. 110).

Because of a 31% decrease in overall consumption of cadmium, production of cadmium dropped by 11% in 2004. Imports of cadmium ingot and powder also decreased by 31.3% to 2,626 t valued at $3.5 million. The major suppliers were the Republic of Korea (35.8%), Canada (19.2%), Peru (14.2%), Germany (10.7%), Russia (6.5%), and China (5.0%) (Ministry of Finance, 2004b, p. 676).

In 2004, demand for domestically produced cadmium decreased by 2.7% to 2,441 t, of which 2,363 t was consumed for the production of nickel-cadmium batteries; 35 t, for the production of alloys; 4 t, for the production of pigments; 1 t, for plating; and 38 t, for other end uses (Japan Mining Industry Association, 2005, p. 112).

Chromium.—Japan relied on imports to meet all chromite ore and concentrate requirements for its iron and steel industry. Japan's imports of chromite ore and concentrate increased by 46.6% to 271,284 t valued at $42.5 million in 2004. The major suppliers were India (59.5%), South Africa (25.3%), the Philippines (4.8%), and Turkey (3.9%) (Ministry of Finance, 2004b, p. 170).

Domestically produced ferrochromium decreased by 30.7% to about 13,500 t in 2004 owing to the temporary shutdown of JFE Steel Corp.'s East Japan Refinery in Chiba Prefecture because of environmental problems and increased imports of high-carbon ferrochromium. In 2004, imports of ferrochromium increased by 7.0% to 977,000 t valued at $745.5 million owing to increased demand by stainless steel producers. The major overseas suppliers of ferrochromium were South Africa (53.7%), Kazakhstan (23.8%), Zimbabwe (7.2%), India (6.1%), China (5.0%), and Russia (3.5%) (Ministry of Finance, 2004b, p. 628).

Consumption of ferrochromium increased by 1.6% to 908,300 t, of which 864,200 t was high-carbon ferrochromium and 44,000 t, low-carbon ferrochromium (Ministry of Economy, Trade and Industry, 2004c, p. 216). Exports of ferrochromium totaled 2,597 t valued at $6.0 million, of which 2,556 t was low-carbon ferrochromium and 41 t, high-carbon ferrochromium. The major buyers of ferrochromium were the United States (79.3%), Thailand (13.0%), and India (4.6%) (Ministry of Finance, 2004a, p. 500).

Ferrochromium is one of the seven rare metals stockpiled under the National Stockpile Program, which was managed by JOGMEC, and the private stockpile program, which was managed by the Japan Rare Metal Association. Ferrochromium was stockpiled in the form of nugget. As of December 2004, the National Stockpile Program had about 30.4 days' supply, or 72.3% of its target (Japan Oil, Gas and Metals National Corporation, 2005b).

Production of chromium metal was by JFE Materials (formerly NKK Materials), which operated a 1,000-t/yr plant that used the silicothermic method at Shinminato in Toyama Prefecture, and by Nippon Denko Co. Ltd., which operated an

800-t/yr plant that used the aluminothermic reduction method at Oshima and was located a few kilometers south of Shinminato in Toyama Prefecture. In 2004, JPE Materials was estimated to produce 1,000 t of chromium metal, and Nippon Denko produced about 600 t and was expected to produce 700 t in 2005. In Japan, chromium metal was consumed mainly in the manufacture of supperalloys, heat-resisting steel, and electronic materials. In 2004, Japan imported 3,682 t of chromium ingot and powder, which was worth $29 million, to meet its demand for chromium metal. The major suppliers were China (1,836 t), the United States (632 t), France (496 t), Russia (329 t), and the United Kingdom (308 t) (Arumu Publishing Co. Ltd., 2005, p. 102).

Cobalt.—Japan relied 100% on imported cobalt matte and other intermediate products of cobalt for metal production. Sumitomo Metal Mining Co. Ltd., which was Japan's sole producer of cobalt metal and cobalt salts (cobalt sulfate and cobalt oxide), operated a cobalt refinery in Niihama, Ehime Prefecture, with the capacity of 600 t/yr (Arumu Publishing Co. Ltd., 2005, p. 75). Japan also imported cobalt hydroxide, metal, oxide, and powder to meet its cobalt requirements.

In 2004, imports of cobalt matte, other intermediate products of cobalt, cobalt ingot, and powder totaled 14,715 t valued at $716.7 million. The major suppliers were Finland (26.7%), Australia (22.8%), Canada (15.7%), Zambia (11.6%), Norway (8.2%), and Belgium (3.9%). Japan also imported 2,108 t of cobalt oxide and 518 t of cobalt hydroxide. Belgium and Finland were the two principal suppliers of cobalt oxides and accounted for 66.6% and 20.9%, respectively. Belgium and Finland were also the two principal suppliers of cobalt hydroxide and accounted for 40.1% and 25.7%, respectively. Import bills of cobalt oxide and hydroxide totaled $104.2 million (Ministry of Finance, 2004b, p. 182, 676).

In 2004, demand for cobalt metal decreased by 3.3% to 3,425.6 t, of which 873 t was for specialty steel; 489 t, for pipe, plate, rod, and wire; 419 t, for ultrahard tool steel (cemented carbides); 210 t, for manufacturing of magnetic materials; 254 t, for catalysts; and 1,181 t, for other end uses (Ministry of Economy, Trade and Industry, 2004c, p. 282). According to an estimate by Mitsui & Co. Ltd., the overall demand for cobalt, which included ingot, oxide, powder, and salt, was estimated to be 12,600 t in 2004 compared with 11,000 t in 2003 and 9,400 t in 2002. Demand for cobalt in lithium ion batteries started to weaken in late 2004, and battery manufacturers began reducing their inventory levels. Overall demand for cobalt was projected to decrease to 11,500 t in 2005 (Arumu Publishing Co. Ltd., 2005, p. 75, 77).

Cobalt is one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of broken cathode and crushed ingot. As of December 2004, the National Stockpile Program had 24.2 days' supply, or 57.6% of its target (Japan Oil, Gas and Metals National Corp., 2005b).

Copper, Lead, and Zinc.—Toyoha Mining Co. Ltd., which operated the Toyoha Mine in Hokkaido Prefecture, was Japan's sole lead and zinc mining company. In 2004, the mine produced about 403,000 t of crude ore, and the mill produced about 5,510 t of lead and about 47,800 t of zinc in concentrates; the mill also produced about 76 t of byproduct silver and a negligible quantity of byproduct copper in lead and zinc concentrates. In 2004, Japan relied on imported ores and concentrates for 86% of its copper smelters' raw materials requirements, 41% of its lead smelters' raw material requirements, and 77% of its zinc smelters' requirements for the production of refined copper, refined lead, and refined zinc (Japan Mining Industry Association, 2005, p. 64, 78, 91, 133; Ministry of Economy, Trade and Industry, 2004d, p. 128).

In 2004, Japan was the world's leading importer of copper concentrate and one of the world's major importers of lead and zinc concentrates. Imports of copper concentrate, in gross weight, increased by 8.5% to 4.5 Mt. The import bill of copper ore and concentrates increased to $3.8 billion from $2.4 billion in 2003. The major suppliers of copper concentrate were Chile (50.6%), Indonesia (13.9%), Australia (9.4%), Canada (7.8%), Peru (7.4%), Papua New Guinea (4.7%), and Argentina (3.7). In 2004, imports of copper ore and concentrate measured by metal content totaled more than 1.27 Mt of copper, of which 52.5% was from Chile; 14.8%, from Indonesia; 8.1%, from Australia; 7.9%, from Canada; 7.1%, Peru; 3.8%, from Papua New Guinea; and 3.0%, from Argentina (Ministry of Finance, 2004b, p. 169-70; Japan Mining Industry Association, 2005, p. 65).

In 2004, imports of lead ore and concentrate, in gross weight, decreased by 23.7% to 140,716 t. The import bill of lead ore and concentrate, however, increased to $103.2 from $71.8 million in 2003. The major suppliers of lead ore and concentrate were the United States (52.2%), Australia (26.8%), Bolivia (8.8%), and Russia (8.4%). Imports of zinc ore and concentrates, in gross weight, increased by 6.1% to 1.13 Mt and the import bill for zinc ore and concentrates increased to $342 million from $238.2 million in 2003. The major suppliers of zinc ore and concentrate were Australia (35.9%), the United States (16.7%), Peru (16.1%), Canada (8.3%), Bolivia (13.2%), and Mexico (4.9%) (Ministry of Finance, 2004b, p. 179).

To secure more captive copper concentrate from overseas nonferrous metals mines in which Japanese nonferrous metal mining companies held substantial equity and provided long-term loans, Sumitomo Metal Mining and Sumitomo Corp. jointly announced in October that they had reached an agreement in principle with Phelps Dodge Corp. of the United States and Compania de Minas Buenaventura S.A.A. of Peru to acquire an equity interest in Socidad Minera Cerro Verde S.A.A. (Cerro Verde), which operated a copper mine near Arequipa, Peru (table 9). As of October 2004, Phelps Dodge owned 82.5% of Cero Verde, and Buenaventura owned 9.2%. According to Sumitomo Metal Mining, the joint Sumitomo interests in Cero Verde could range between 21% and 25% with an investment of between $265 million and $334 million, of which Sumitomo Metal Mining and Sumitomo Corp. would hold 80% and 20%, respectively, of the joint equity in the project. The joint Sumitomo investment in the project would increase capital and raise funds for the planned $850 million sulfide ore production capacity expansion to produce up to 180,000 t/yr of copper contained in copper concentrate beginning in the fourth quarter of 2006, and Sumitomo would have the right to purchase at least the percentage (21%) of its equity interests in Cerro Verde of the copper concentrate (Sumitomo Metal Mining Co. Ltd., 2004d§).

In January 2004, Pan Pacific Copper Co. Ltd., which was a joint venture of Nippon Mining & Metals (66%) and

Mitsui Mining & Smelting (34%), reached an agreement with Philex Mining Corp. of the Philippines for a long-term loan arrangement for mine expansion to develop a deeper ore zone at its Padcal Mine, which is located about 200 kilometers (km) north of Manila, on Luzon Island (table 9). In return, Pan Pacific Copper would offtake between 50,000 and 70,000 t/yr of the copper-gold concentrate, which contains about 15,000 t/yr of copper and 2 t/yr of gold to be produced at the mine during the next 6 to 7 years of the mine life (Nippon Mining & Metals Co. Ltd., 2004§; Pan Pacific Copper Co. Ltd., 2004§).

Metal production of copper decreased in 2004 because of lower overseas demand for refined copper. Metal production of lead and zinc decreased in 2004 owing to weaker domestic and overseas demands for refined lead and zinc in 2004. Japan's capacity utilization rate of the nonferrous metals smelting and refining industry was 94.5% for copper, 84.6% for zinc, and 80.5% for lead (Ministry of Economy, Trade and Industry, 2004c, p. 110-113, 160. 268, 270, 274).

During 2004, Sumitomo Metal Mining continued to undertake its copper expansion project at the Toyo smelter and refinery complex at Saijyo, Ehime Prefecture. The copper-refining capacity would be raised to 410,000 t/yr when the expansion project is scheduled to be completed in fiscal year 2005. The planned acquisition of equity interest in Cerro Verde was part of the company's basic strategy to secure inhouse (captive) copper ore and concentrate to feed the forthcoming increase in the refined copper production capacity at the Toyo Smelter (Sumitomo Metal Mining Co., Ltd., 2004, p. 3, 15).

Imports of refined copper increased by 11.9% to 88,200 t valued at $250.9 million in 2004. The major suppliers of refined copper were Chile (60.7%), Peru (13.2%), Republic of Korea (10.6%), Zambia (5.0%), China (2.7%), Indonesia (1.8%), and Thailand (1.5%). Imports of refined lead increased by 11.7% to 10,380 t valued at about $13.9 million. The principal suppliers of refined lead were China (87.1%) and Peru (11.9%). Imports of zinc slab (refined zinc) increased by 3.0% to 42,400 t valued at about $45.8 million. The major suppliers of zinc slab were China (44.4%), Peru (33.9%), Namibia (9.7%), and Canada (8.4%) (Ministry of Finance, 2004b, p. 662, 673).

Demand for refined copper increased by 6.1% to 1.23 Mt in 2004. Demand for refined copper, by sector, was 759,000 t for wire and cable, 446,000 t for brass mill products, and 24,000 t for others (Ministry of Economy, Trade and Industry, 2004c, p. 268). Exports of refined copper decreased by 32.8% to 194,600 t valued at $566.7 million in 2004. The buyers of refined copper were Taiwan (38.4%), China (32.5%), the Republic of Korea (9.5%), Thailand (6.2%), Indonesia (4.6%), Malaysia (3.6%), the United States (3.0%), and other countries (2.2%). Exports of unrefined copper and copper anodes decreased by 21.4% to 8,120 t in 2004 valued at $28.0 million. Most unrefined copper and copper anodes was exported to China (including Hong Kong) (31.7%), Taiwan (30.8%), and the Republic of Korea (28.2%) (Ministry of Finance, 2004a, p. 569).

In 2004, the demand for refined lead decreased by 14.6% to 177,500 t, of which 134,000 t was for storage batteries; 24,500 t, for inorganic chemicals; 7,020 t, for solder; 2,860 t, for lead pipe and sheet; and 9,120 t, for other uses (Ministry of Economy, Trade and Industry, 2004c, p. 270). Exports of refined lead decreased by 65.0% to 2,827 t valued at $2.4 million. The major buyers of refined lead were China (including Hong Kong) (57.2%), Thailand (13.3%), Malaysia (9.2%), and Taiwan (5.7%) (Ministry of Finance, 2004a, p. 583).

Demand for zinc slab decreased by 1.8% to 476,000 t, of which 229,000 t was for sheet galvanizing; 83,300 t, for other plating; 66,100 t, for brass mill products; 48,000 t, for die-cast alloy; 28,100 t, for inorganic chemicals; and 21,500 t, for other uses (Ministry of Economy, Trade and Industry, 2004c, p. 274). Exports of zinc slab decreased by 3.6% to 61,655 t valued at $65.8 million. The major buyers were Taiwan (32.2%), Indonesia (26.7%), the Philippines (16.8%), Vietnam (15.7%), Malaysia (4.2%), Thailand (1.6%), and Cambodia (1.5%) (Ministry of Finance, 2004a, p. 583-584).

Gold and Silver.—Mine production of gold was mainly by Sumitomo Metal Mining from the Hishikari Mine in Kagoshima Prefecture on Kyushu Island. The company, which was working on its Honko, Sanjin, and Yamada deposits in the Hishikari mining area, produced about 185,000 t of ore and averaged 40.7 grams per metric ton (g/t) gold, or about 7.5 t of gold in 2004 (Japan Mining Industry Association, 2005, p. 133). Other small-scale gold and silver mines were the Arkesi and the Kasuga in Kagoshima Prefecture. Toyoha Mining produced most of Japan's mined silver as a byproduct of lead and zinc mining operations from the Toyoha Mine in Hokkaido Prefecture. Overall mine production of gold and silver was about 8,000 kilograms (kg) and 76,000 kg, respectively (Ministry of Economy, Trade and Industry, 2004d, p. 128).

In May 2004, Sumitomo Metal Mining and its partners Sumitomo Corp. and Teck Cominco Ltd. of Canada completed and approved the final feasibility study for the Pogo gold project in Alaska. All the necessary development permits reportedly had been received, and full-scale construction started after a National Pollutant Discharge Elimination System permit was granted by the U.S. Environmental Protection Agency on May 7, 2004. The total capital cost was estimated to be $280 million, and the target date for the initial operations was scheduled to begin in March 2006, which was about 4 months behind the original target date of December 2005. According to the final feasibility study, the total resources were estimated to be 152 t of gold, and average annual production of gold was estimated to be 12 t at full capacity with 10 years of mine life. The Pogo joint-venture project, which is located about 145 km southeast of Fairbanks, Alaska, was 51% owned by Sumitomo Metal Mining America Inc. (a wholly owned subsidiary of Sumitomo Metal Mining); 40%, by Teck Cominco, the project operator; and 9%, by SC Minerals America, Inc. (a wholly owned subsidiary of Sumitomo Corp.) (Mining Journal, 2004; Sumitomo Metal Mining Co. Ltd., 2004b§).

In 2004, metal production of primary gold and silver decreased by 15.4% and 10.0%, respectively, owing mainly to reduced raw materials inputs at the gold and silver refineries. Imports of gold (ingot and powder) increased by 63.4% to 70,400 kg valued at $912 million. The major suppliers of gold ingot and powder were Switzerland (44.8%), Australia (15.3), Hong Kong (12.0%), the United States (11.8%), Uzbekistan (7.6%), the Republic of Korea (2.7%), Belgium (2.1%), and South Africa (1.8%). Imports of silver (ingot and powder) increased by 35.4% to 1,715 t valued at $273 million. The major suppliers of silver ingot and powder were Peru (24.2%), Mexico (24.1%), the Republic of Korea (20.4%), Australia (15.1%), the United States (5.9%), China (4.6%), and Russia (2.1%) (Ministry of Finance, 2004b, p. 621-622).

In 2004, the demand for gold, which included dental and medical, electrical and electronic, industrial arts and crafts, jewelry, and private investment, increased slightly to 290,000 kg from 288,000 kg in 2003. The demand for gold by end user was for dental and medical, which decreased to about 21,400 kg from about 22,400 kg in 2003; electrical, electronic, and communication apparatus, increased to about 86,300 kg from 85,100 kg; private hoarding, increased to 80,500 kg from 79,500 kg; gold plating, increased to 23,600 kg from 23,500 kg; jewelry, decreased to 20,200 from 20,500 kg; industrial arts and crafts, decreased to 4,650 kg from 4,880 kg; pottery and porcelain, decreased to 1,420 kg from 1,530 kg; decorations and badges, decreased to 1,410 kg from 1,500 kg; and other uses, remained unchanged at about 48,100 kg (table 6). Among the end users, demand for jewelry reached another new low at 20,200 kg in 2004 (Arumu Publishing Co. Ltd., 2005, p. 115).

In 2004, demand for silver decreased by 3.0% to 2,600 t. Demand for silver by end user was for silver nitrate for photography and other uses, 1,240 t, and 307 t, respectively; electrical contacts, 260 t; rolled products, 248 t; brazing alloy (silver solder), 105 t; and other uses, 434 t (table 6). The substantial decline in silver nitrate demand for photography was offset by increased demand for silver nitrate for other uses and for electrical contacts (Ministry of Economy, Trade and Industry 2004c, p. 288).

Exports of gold ingot and powder decreased by 50.4% to 11,250 kg in 2004 valued at $144.8 million. The major buyers of refined gold ingot and powder were the United Kingdom (63.3%), Hong Kong (9.9%), the United Arab Emirates (7.2%), the Republic of Korea (6.9%), Taiwan (4.1%), Singapore (3.0%), and Vietnam (2.7%). Exports of silver ingot and powder increased by 36.6% to 601.6 t in 2004 valued at $47.3 million. The major buyers of refined silver and powder were Singapore (20.7%), China (20.2%), Taiwan (15.6%), the Republic of Korea (15.0%), Hong Kong (12.9%), the United States (4.9%), the United Kingdom (3.9%), and Malaysia (3.0%) (Ministry of Finance, 2004a, p. 495-496).

Iron and Steel.—In 2004, Japan relied 100% on imports to meet the iron ore requirements of its iron and steel industry. Imports of iron ore increased by 2.2% to 134.9 Mt valued at $3.98 billion. The average cost, insurance, and freight (c.i.f.) import price of iron ore was $29.56 per metric ton compared with $25.02 per ton in 2003. The major suppliers of iron ore were Australia (63.3%), Brazil (17.8%), India (9.0%), South Africa (3.6%), and the Philippines (3.4%). Imports of pig iron totaled 599,000 t valued at $174.7 million. The average c.i.f. import price of pig iron was $291.86 per ton compared with $187.54 per ton in 2003. The major suppliers of pig iron were China (55.9%), Brazil (18.2%), India (8.6%), Russia (7.5%), North Korea (6.1%), and South Africa (2.2%) (Ministry of Finance, 2004b, p. 169, 626).

To secure the long-term supply of iron ore, Nippon Steel Corp. reached a basic agreement with Companhia Vale do Doce (CVRD) of Brazil for the supply of 7 Mt/yr of iron ore (4 Mt/yr from Carajas and 3 Mt/yr from Itabira) for 10 years beginning in April 2005 through 2014. Nippon Steel also had a 5-year contract for the supply of 2 Mt/yr of Nibrasco pellet with CVRD and a 3-year contract with Minerações Brasiliras Reunidas S/A (MBR) for the supply of 2 Mt/yr of iron ore; MBR was equally owned by CVRD and Mitsui & Co. of Japan. By combining the three contracts, Nippon Steel's total purchase of iron ore and pellets from Brazil would be of 11 Mt/yr (Nippon Steel Corp., 2004a§).

JFE Steel Corp. reached a basic agreement with BHP Billiton Ltd. of Australia, Itochu Corp., and Mitsui & Co. in August 2004 to establish a joint venture at the Yandi Mine in Australia and signed a long-term iron ore purchase contract with BHP Billiton. The Yandi Mine was an important iron ore source to supply more than 20% of JFE Steel's annual iron ore requirements. The mine produced about 40 Mt/yr and contained about 1 billion metric tons of minable reserves. The joint venture, which was to be established after July 2005 at the Yandi Mine, would be owned by BHP Billiton (68%), JFE Steel (20%), Itochu (6.4%), and Mitsui & Co. (5.6%) for the W-4 mining area where the economically exploitable reserves were estimated to be 110 Mt; from there, up to 15 Mt/yr of iron ore would be produced. According to the long-term iron ore purchase contract, which was valued at about $3.7 billion, JFE Steel would purchase 16 Mt/yr beginning on April 1, 2005, for 11 years or the equivalent of one-third of JFE Steel's annual iron ore requirement (BHP Billiton Ltd., 2004§; JFE Steel Corp., 2004b§).

In September, JFE Steel also signed a contract with CVRD for long-term iron ore supplies. According to the contract, CVRD would supply 7 Mt/yr of iron ore to JFE Steel beginning in April 2007 for 10 years. Under a separate contract signed earlier through Philippines Sinter Corp. (PSC) (a wholly owned subsidiary of JFE Steel), CVRD would supply 2.2 Mt/yr of iron ore to PSC and about 800,000 t/yr of pellet to JFE Steel. By combining the two contracts, JFE Steel's total iron ore purchases from CVRD would be about 10 Mt/yr beginning in April 2007, which would make JFE one of the leading buyers of CVRD iron ore among all Japanese steel producers (JFE Steel Corp., 2004a§).

In November, Nippon Steel and BHP Billiton reached a basic agreement to explore mutually the possibility of a strategic alliance through a joint venture for the development of new mines and the expansion of such existing mines as coking coal, iron ore, and manganese, combined transport (joint vessel arrangement), and major joint studies on the utilization of iron ore and coking coal. Earlier in April, Nippon Steel and the Rio Tinto Group also reached a basic agreement to create a comprehensive alliance for the acquisition of interest in and joint development of Australian coking coal and iron ore mines and the conclusion of a long-term contract for such raw materials and for cooperation in marine transport and technical exchanges regarding the use of metallurgical raw materials (Nippon Steel Corp., 2004a§, b§)

In 2004, pig iron production increased by 1.1% to about 83 Mt, of which 82.4 Mt was for steelmaking and 584,500 t, for foundry. The iron manufacturing capacity, however, decreased to 82.0 Mt/yr from 84.4 Mt/yr in 2003. The number of furnaces for iron manufacturing decreased to 29 from 31. The number of blast furnaces decreased to 28 from 30 in 2003, and other furnaces remained unchanged at 1 (Ministry of Economy, Trade and Industry, 2004c, p. 32, 107).

In 2004, crude steel production increased by 2.0% to 112.7 Mt, of which 73.6% was processed by basic oxygen furnaces (LD converters), and 26.4%, by electric furnaces. The steel manufacturing capacity increased to 120.8 Mt/yr from 120.5 Mt/yr in 2003. The number of furnaces for steel manufacturing decreased to 415 from 416 in 2003. The number of basic oxygen furnaces (LD converters) remained unchanged at 62, and the number of electric arc furnaces decreased to 353 from 354 in 2003 (Ministry of Economy, Trade and Industry, 2004c, p. 44, 107).

In 2004, Japan was the world's second ranked producer of crude steel after China and accounted for 10.7% of the world total. Among Japan's top four steelmakers in 2004, Nippon Steel, which produced 32.4 Mt of crude steel, was the third ranked steel-producing company in the world after Arcelor S.A. of Luxembourg and Mittal Steel Co. of the Netherlands; JFE Steel, which produced 31.6 Mt, ranked fourth; Sumitomo Metal Industries, Ltd., which produced 13.0 Mt, ranked 14th; and Kobe Steel Ltd., which produced 7.7 Mt, ranked 25th (International Iron and Steel Institute, 2005§).

To develop a next-generation coke oven, an innovative coke production process that features environmental friendliness, energy savings, and high productivity called SCOPE 21 (super coke oven for productivity and environment enhancement in the 21st century) and the basic research and development of Ultra Steel reportedly were completed in fiscal year 2003. Studies were undertaken in 2004 to utilize the next-generation coke oven technology with actual equipment and to put the new Ultra Steel into practical use (Japan Iron and Steel Federation, 2005§).

In 2004, domestic demand for steel, which was measured by domestic orders for ordinary and specialty steel products, increased by 4.6% to about 67.5 Mt, of which 55.2 Mt was ordinary steel products and 12.2 Mt, specialty steel products. The increase in overall domestic demand for steel in 2004 was mainly the result of a 4.3% increase in demand by the manufacturers of automobiles and an 18.4% increase in demand by the manufacturers of shipbuilding and marine equipment. Domestic demand also increased in all other end use categories (table 7).

In 2004, exports of iron and steel increased by 2.6% to 35.3 Mt mainly because of a 7.1% increase in exports to China and a 7.4% increase in exports to Thailand and a relatively high level of exports to the Republic of Korea and Taiwan. Exports to Europe increased by 46.9% to 1.1 Mt and to the United States, by 31.0% to 1.4 Mt in 2004 (table 8). Of the exports of iron and steel, 73.6% was ordinary steel products; 15.2%, specialty steel products; 8.8%, steel ingots and semifinished products; 1.7%, secondary products; 0.1%, pig iron; and 0.6%, others (ferroalloy, clad plate, and cast-iron pipes). In 2004, Japan also exported 136,629 t of ferroalloy compared with 130,830 t in 2003 (Japan Iron and Steel Federation, 2005§).

In 2004, imports of iron and steel products increased by 18.4% to 7 Mt owing mainly to a 21.4% increase in imports of ordinary steel products. Of the total imports, 3.5 Mt was ordinary steel products; 2.7 Mt was pig iron, ferroalloys, steel ingot, and semimanufactured steel; 498,837 t, secondary steel wire and other secondary steel products; and 299,163 t, specialty steel products. Among the ordinary steel product imports, hot-rolled wide strip increased by 10.1%; cold-rolled sheet and strip, by 17.2%; and plates, by 110%. Specialty steel product imports jumped by140% to 300,000 t. The major suppliers of ordinary steel products were the Republic of Korea (54.7%), Taiwan (23.2%), and China (15.8%) in 2004 (Japan Iron and Steel Federation, 2005§).

Japan' export earnings from iron and steel products were valued at $28.9 billion, and the import bill of iron and steel products was valued at $8.8 billion in 2004 (Ministry of Finance, 2004a, p. 37-38; 2004b p. 37-38).

Manganese.—Japan relied entirely on imports to meet its manganese raw material requirements for the iron and steel and EMD industries. In 2004, Japan imported 1.08 Mt of high-grade manganese ore, 102,645 t of ferruginous manganiferous ore, 75,323 t of low-grade manganese ore, and 900 t of high-grade manganese dioxide ore. The major suppliers of high-grade manganese dioxide ore were China (44.4%), Colombia (33.3%), and Gabon (22.2%). The major suppliers of high-grade manganese ore were South Africa (62.0%) and Australia (36.1%). The major suppliers of low-grade manganese ore were Ghana (72.1%) and South Africa (27.8%). The major suppliers of ferruginous manganiferous ore were South Africa (71.4%) and India (27.1%). The import bill for manganese ores totaled $167.0 million (Ministry of Finance, 2004b, p. 169).

Production of ferromanganese increased by 17.6% to 437,400 t in 2004 (Ministry of Economy, Trade and Industry, 2004c, p. 34). As a result, imports of ferromanganese decreased by 41.4% to 51,200 t in 2004. The major suppliers were Australia (35.3%), China (30.9%), South Africa (25.7%), and the Republic of Korea (4.7%). In 2004, Japan also imported 300,452 t of ferrosilicomanganese principally from China (65%), Ukraine (11.0%), and India (8.5%). The import bill for ferromanganese and ferrosilicomanganese was valued at $334.1 million (Ministry of Finance, 2004b, p. 627-628).

Consumption of high- and low-carbon ferromanganese for steel manufacturing increased slightly to 396,000 t, of which 337,000 t was high-carbon ferromanganese and 59,000 t, low-carbon ferromanganese (Ministry of Economy, Trade and Industry, 2004c, p. 216). Exports of ferromanganese decreased by 43.3% to 9,900 t in 2004. The major buyers were Taiwan (42.5%), the Republic of Korea (13.2%), the United States (12.2%), Malaysia and Thailand (7.7% each), and Saudi Arabia (6.1%). Export earnings from ferromanganese were valued at $11.5 million (Ministry of Finance, 2004a, p. 500).

In 2004, Japan was the world's second ranked producer of EMD after China. Japan's EMD producers were Mitsui Mining & Smelting, which operated the Takehara plant (24,000 t/yr) in Hiroshima Prefecture, and Tosoh Corp., which operated the Hyuga plant (32,000 t/yr) in Miyazaki Prefecture and the Thessaloniki (Salonita) plant (18,000 t/yr) in Greece. In 2004, Japan produced about 45,700 t of EMD, about 17,600 t of which was consumed domestically for the production of batteries. In 2004, imports of EMD totaled 6,980 t valued at $7.7 million.

China and South Africa were the principal suppliers and accounted for 71.5% and 18.7%, respectively. Exports of EMD totaled 29,822 t valued at $36.6 million. The major buyers were Indonesia (27.7%), Singapore (18.8%), China (12.3%), the Republic of Korea (10.3%), the United States (7.1%), Germany (6.3%), and Hong Kong (5.6%) (Arumu Publishing Co. Ltd., 2005, p. 38; Ministry of Finance, 2004a, p. 114; 2004b, p. 182).

Manganese was one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of ferromanganese nugget. As of December 2004, the National Stockpile Program had 31.8 days' supply, or 75.6% of its target. The National Stockpile Program sold 15,000 t of ferromanganese for the first time in April 2004; this stockpile release was taken during normal market conditions and was not in response to a rapid rising price period (Japan Oil, Gas and Metals National Corp., 2005b).

Molybdenum.—Japan was one of the world's leading consumers of molybdenum and relied entirely on imports to meet the requirements for its iron and steel and molybdenum metal manufacturing industries. In 2004, imports of roasted molybdenum trioxide (MoO_3) increased by 8.4% to 35,462 t valued at $605.4 million. The major suppliers were Chile (55.8%), Mexico (14.0%), Canada (9.6%), China (6.1%), and the United States (5.8%) (Ministry of Finance, 2004b, p. 170).

In 2004, consumption of molybdenum concentrate totaled 10,303 t, of which 4,683 t was for the production of ferromolybdenum; 2,211 t, for the production of inorganic chemicals; 897 t, for the production of molybdenum metal; 815 t for the production of molybdenum briquette clinker; and 1,696 t for other (Ministry of Economy, Trade and Industry, 2004c, p. 286).

Production of molybdenum metal and ferromolybdenum increased by 44.7%, and 23.5%. respectively, in 2004 because of stronger demand by the makers of specialty steel and magnetic materials. To meet domestic demand, Japan also imported 5,066 t of ferromolybdenum valued at $97.2 million. The principally suppliers were China (92.4%) and Chile (6.1%). Imports of molybdenum metal, which included ingots and powders, totaled 974 t valued at $35.3 million. The major suppliers of molybdenum metals were Germany (38.4%), China (33.4%), and the United States (26.8%) (Ministry of Finance, 2004b, p. 628, 675).

Consumption of ferromolybdenum by the steel manufacturers totaled 5,644 t in 2004. Consumption of molybdenum metal totaled 2,980 t, of which 72% was consumed by the makers of specialty steel; 18.8%, by makers of steel wire, sheet, and bar; and 9%, by makers of magnetic materials and other. Exports of molybdenum metal totaled 76.5 t valued at $3.3 million in 2004. The major buyers were the Republic of Korea (36.6%), the United States (30.1%), and Thailand (15.0%) in 2004 (Ministry of Economy, Trade and Industry, 2004c, p. 216, 286; Ministry of Finance, 2004a, p. 586).

Molybdenum was one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of crude oxide powder, soluble oxide powder, and pure oxide powder. As of December 2004, the National Stockpile Program had 21 days' supply, or 50% of its target. The National Stockpile Program released 20.4 t of molybdenum crude oxide in June 2003 and 11.9 t of molybdenum crude oxide again in February 2004 during normal market conditions and released 202.7 t of molybdenum crude oxide in April 2004 and 19.4 t of molybdenum soluble oxide and pure oxide in December 2004 during a period of rising prices (Japan Oil, Gas and Metals National Corp., 2005b).

Nickel.—Japan continued to rely on imported raw materials to meet its nickel requirements in 2004. Japan was the world's leading importer and consumer of nickel. Japan was the world's second ranked producer of nickel metal after Russia (World Bureau of Metal Statistics, 2005, p. 104). All nickel ores and nickel mattes were imported for the production of ferronickel, nickel chemicals (salts), nickel oxide sinter, and refined nickel. Additionally, ferronickel, nickel powder and flake, nickel oxide sinter, nickel waste and scrap, and refined nickel also were imported to meet the nickel requirements of the battery, magnetic materials, nonferrous alloys, specialty steel industries, and other end users.

In 2004, imports of nickel ore increased by 7.3% to 4.5 Mt valued at $290.6 million. The suppliers of nickel ore were Indonesia (51.7%), the Philippines (24.3%), and New Caledonia (24.0%). Imported nickel ore from Indonesia contained 37,500 t of nickel; the Philippines, 18,500 t of nickel; and New Caledonia, 19,500 t of nickel. Imports of nickel mattes, in gross weight, increased by 6.1% to 127,400 t valued at $1.1 billion in 2004. The suppliers of nickel matte were Indonesia (74.1%) and Australia (25.9%). Imported nickel mattes from Indonesia contained 70,800 t of nickel and Australia, 24,700 t (Japan Mining Industry Association, 2005, p. 107; Ministry of Finance, 2004a, p. 170, 667).

Imports of ferronickel, in gross weight, decreased by 2.5% to 55,600 t valued at $225.5 million. The suppliers of ferronickel were New Caledonia (66.1%), Colombia (15.2%), the Dominican Republic (13.6%), and Indonesia (4.9%). Imports of refined nickel decreased by 3.1% to 51,960 t valued at $718.0 million. The top suppliers of refined nickel were Russia (19.4%), South Africa (14.2%), China (13.0%), Australia (11.9%), Brazil (10.3%), Zimbabwe (9.3%), Norway (8.0%), Canada (6.6%), and the United Kingdom (5.1%). Imports of nickel oxide sinter, in gross weight, increased by 1.5% to 1,250 t valued at $13.9 million; Australia was the dominant supplier of nickel oxide sinter and accounted for 93.1%. Imports of nickel powders and flakes increased by 28.7% to 9,950 t valued at $131.6 million. The major suppliers of nickel powders and flakes were Canada (48.9%) and the United Kingdom (46.9%). Imports of nickel waste and scrap decreased by 11.8% to 9,400 t valued at $101.9 million. The major suppliers of nickel waste and scrap were the United States (21.5%), the Netherlands (20.3%), Russia (15.1%), the Republic of Korea (14.2%), and Taiwan (8.7%) (Ministry of Finance, 2004b, p. 628, 667).

In 2004, the following companies produced ferronickel: Hyuga Smelting Co. Ltd. (a wholly owned subsidiary of Sumitomo Metal Mining) in Hyuga, Miyazaki Prefecture; YAKIN Oheyama Co. Ltd. (Nippon Yakin Kogyo Group) at Oheyama near Miyazu, Kyoto Prefecture; and Pacific Metals Co. Ltd. in Hachinohe, Aomori Prefecture. Production of ferronickel, in gross weight, increased by 1.4% to 374,200 t, which contained about 74,300 t of nickel. Consumption of ferronickel for steel manufacturing, in gross weight, increased by 1.9% to 314,000 t in 2004 (Arumu Publishing Co. Ltd., 2005, p. 70; Ministry of Economy, Trade and Industry, 2004c, p. 38, 210). Exports of ferronickel increased by 8.8% to 111,000 t valued at $271.9 million, of which 54.6% went to the Republic of Korea and 43.4%, to Taiwan (Ministry of Finance, 2004a, p. 500).

Refined nickel was produced solely by Sumitomo Metal Mining at its nickel refinery in Niihama, Ehime Prefecture. The 36,000-t/yr refinery used its own matte chlorine leaching electrowinning (MCLE) technology to process imported nickel matte from Australia and Indonesia to produce refined nickel and nickel salts for domestic consumption and exports. Tokyo Nickel Co. Ltd. operated a 60,000-t/yr smelter in Matsuzaka, Mie Prefecture, which also used imported nickel matte to produce briquettes, granules, and nickel oxide sinters for domestic consumption and exports.

At the end of August 2004, Sumitomo Metal Mining completed construction of a processing plant at Rio Tuba in the southern part of Palawan Island in the Philippines (Coral Bay Nickel Project) to produce nickel-cobalt-mixed sulfide from laterite low-grade nickel oxide lateritic ore. The total investment by Sumitomo Metal Mining in the project was approximately $180 million. The processing plant, which was expected to operate for a period of about 20 years, started test operations after plant construction was completed in August 2004 and was scheduled begin full-scale commercial production in early 2005. The nickel project got underway after the Coral Bay Nickel Corporation, which was a joint venture of four cooperation partners, was established in April 2002; the four partners and their equity shares were Sumitomo Metal Mining (54%), Mitsui & Co. and Sojitz Corporation (18% each), and Rio Tuba Nickel Mining Corporation (10%). The project's plan called for the plant to process 16 Mt of nickel oxide ores and low-grade laterite (limonite), which were mined and stockpiled at the Rio Tuba mine site, by using high-pressure acid leaching (HPAL), and to produce about 10,000 t of nickel and 700 t of cobalt in nickel/cobalt mixed sulfide, which would be purchased by Sumitomo Metal Mining and delivered to its Niihama Nickel Refinery for the production of electrolytic nickel and electrolytic cobalt with its own MCLE process technology (Sumitomo Metal Mining Co. Ltd., 2004a§).

In October, Sumitomo Metal Mining and Mitsui & Co. jointly announced that they had reached an agreement in principle with Inco Limited to participate jointly in the Goro Nickel Project, which was being promoted by Inco in New Caledonia, and that they had concluded a memorandum of understanding (MOU) to negotiate a definitive agreement with Inco concerning the terms and conditions of their acquisition and certain other arrangements covering their participation in the project. The large-scale Goro Nickel Project, which has an extensive nickel resource base, was expected to start production in late summer 2007 by using the HPAL process technology. The project would have a mine capacity of 60,000 t/yr of nickel in nickel oxide and between 4,300 and 5,100 t/yr of cobalt in cobalt carbonate. Sumitomo Metal Mining and Mitsui & Co. would have the right to offtake nickel and cobalt in proportion to each company's equity ratio. According to the earlier reviewing study, the total project capital cost was about $1.87 billion. Sumitomo Metal Mining was expected to acquire 11% of the project's equity interest and Mitsui & Co., 10% (Sumitomo Metal Mining Co. Ltd., 2004c§).

In 2004, the domestic demand for refined nickel decreased by 1.5% to 68,400 t owing to weaker demand by the manufacturers of specialty steel. The consumption of refined nickel by manufacturers of specialty steel decreased by 5.3% to 55,300 t and galvanized sheet decreased by 6.6% to 2,890 t. Consumption increased for batteries by 39.8% to 4,440 t; magnetic materials, 21.1% to 2,230 t; catalysts, 17.6% to 480 t; and other end uses, 19.2% to 3,060 t (Ministry of Economy, Trade and Industry, 2004c, p. 280).

Exports of refined nickel increased by 114.4% to 223 t valued at $3.7 million in 2004. The major buyers of refined nickel were Indonesia (50.0%), Thailand (31.4%), the Philippines (8.4%), and China (7.3%). Exports of nickel oxide sinter and other intermediate products of nickel metallurgy increased by 17.1% to 32,700 t valued at $390.9 million. The principal buyers were the Republic of Korea (51.4%), Taiwan (46.4%), and the Netherlands (2.1%). Exports of nickel powders and flakes remained about the same at 1,670 t valued at $50.8 million in 2004. The major buyers were China (62.0%), Taiwan (19.5%), and France (5.0%). Exports of nickel waste and scrap decreased by 38.3% to 400 t valued at $3.2 million in 2004. The major buyers were the United States (44.2%), the United Kingdom (31.5%), and Taiwan (14.9%) (Ministry of Finance, 2004a, p. 576).

Nickel was one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of nickel metal plate, ferronickel ingot, and nickel oxide granule and briquette. As of December 2004, the National Stockpile Program had 25.6 days' supply, or 61% of target. During the past 21 years, the National Stockpile Program has never released or sold any nickel in any form either in normal market conditions or in a period of rising prices (Japan Oil, Gas and Metals National Corp., 2005b).

Titanium.—Japan was the world's second ranked producer of titanium sponge metal after Russia and accounted for 30.7% of the world total (Arumu Publishing Co. Ltd., 2005, p. 54). Japan also was one of the world's major producers of titanium dioxide pigment. All the raw material requirements for production of titanium sponge metal and titanium dioxide pigment were supplied by imports, mainly from Australia, India, and Vietnam. Titanium ore (rutile) was consumed by the producers of titanium sponge metal. Ilmenite and titanium slag were consumed by the manufacturers of synthetic rutile and titanium dioxide pigment.

In 2004, imports of titanium ore (rutile) increased by 2.1% to 90,000 t valued at $44.2 million. The major suppliers were Australia (56.7%), India (30.6%), South Africa (7.4%), and Canada (5.1%). Imports of ilmenite decreased by 2.4% to 360,300 t valued at $39.1 million. The major suppliers were Vietnam (42.3%), Australia (23.5%), Canada (14.8%), India (9.0%), Egypt (7.7%) and Malaysia (2.7%) in 2004 (Ministry of Finance, 2004b, p. 170). In 2004, imports of titanium slag for titanium oxide pigment production increased by 30.1% to 132,000 t and came mainly from South Africa (66.8%) and Canada (32.9%) (Arumu Publishing Co. Ltd., 2005, p. 99).

According to the estimate by Advanced Materials Japan Corporation, production of titanium sponge increased by

24.2% to 23,500 t in 2004 because of the stronger domestic demand and increased exports to the EU. Total titanium sponge shipments increased by 40.9% to 26,200 t in 2004. Shipments of titanium sponge to the domestic market increased by 39.5% to 18,000 t. In 2004, exports of titanium sponge increased by 36.2% to 8,120 t, and imports decreased by 2.5% to 5,570 t. In 2004, shipments of titanium mill products increased by 25.6% to 17,400 t; domestic shipments of titanium mill products increased by 25.9% to 8, 570 t, and exports of titanium mill products increased by 25.4% to 8,810 t (Arumu Publishing Co. Ltd., 2005, p. 54-55).

Because of rising worldwide demand for titanium sponge metal, Toho Titanium Co. Ltd. planned to spend $14.56 million to boost its sponge production capacity by 7.7% to 14,000 t/yr by February 2005 and to expand the capacity to 15,000 t/yr by October 2005. Sumitomo Titanium Corp., however, did not announce any plans to boost its sponge metal production capacity, but it was expected to operate at its full capacity of 18,000 t/yr in 2005. Kobe Steel, which was a major producer of titanium mill products, estimated that the worldwide demand for titanium mill products would reach more than 50,000 t compared with about 38,000 t in 2003 (Yahoo.com, 2004§).

In 2004, production of titanium dioxide decreased slightly to 253,400 t owing to a weaker domestic demand (Ministry of Economy, Trade and Industry, 2004b, p. 60). Shipments of titanium dioxide totaled 254,800 t, of which domestic shipments were 167,300 t and exports, 87,500 t. In 2004, consumption by the end users was for paints and coating materials (44.5%), printing inks and pigments (21.6%), synthetic resin (plastics) (10.8%), paper (8.9%), chemical fibers and rubbers (1.5%, each), condensers (1.1%), and others (10.1%) (Arumu Publishing Co. Ltd., 2005, p. 99).

Imports of titanium oxide increased by 31.1% to 15,200 t valued at $21.6 million. The major suppliers were China (56.7%), the Republic of Korea (23.5%), France (10.7%), and Australia (5.4%) in 2004 (Ministry of Finance, 2004b, p. 182). Exports of titanium oxide increased by 8.5% to 31,100 t valued at $92.0 million. The major buyers were China (41.4%), Taiwan (26.9%), the Republic of Korea (8.6%), the United States (4.9%), Indonesia (3.2%), and the Netherlands and Thailand (2.2% each) in 2004 (Ministry of Finance, 2004a, p. 114).

Tungsten.—Japan's last tungsten mine, the Kiwada Mine in Yamaguchi Prefecture, was closed in 1993. Japan has relied on imports to meet tungsten requirements for its iron and steel and tungsten metal manufacturing industries since 1994. In 2004, Japan imported 134 t of tungsten ore and concentrate (contained 73 t tungsten) principally from Russia (97.8%) and 2,788 t of ammonium tungstate principally from China (99.9%) with a combined value of $21.2 million in 2004. Japan also imported 1,329 t of ferrotungsten (contained 1,023 t tungsten) entirely from China valued at $9.4 million in 2004. Consumption of ferrotungsten for steel manufacturing, in gross weight, amounted to 1,006 t in 2004 (Ministry of Economy, Trade and Industry, 2004c, p. 216; Ministry of Finance, 2004a, p. 170, 188;).

In 2004, production of tungsten metal increased by 25% to 4,166 t. The major producers of tungsten metal and powder were Japan Newer Metals Co. Ltd., Toho Kinzoku Ltd., and Tokyo Tungsten Co. Ltd. To meet domestic demand for tungsten powder and metal, Japan imported 663 t of tungsten powder mainly from China (80.5%) and Germany (10.9%) and 142 t of tungsten metal principally from China (99.9%) in 2004. In 2004, demand for tungsten metal, which included powder, decreased by 37.8% to 6,126 t owing to a sharp drop in demand by the makers of contact points. In 2004, about 89% of tungsten metal was consumed by the makers of ultra-hard alloyed tool steel, and the remainder, by the makers of bars, contact points, plates, specialty steel, and wire. Japan exported 186 t of tungsten powder mainly to Thailand (36%), and China, Austria, and the United States (18% each) (Ministry of Finance, 2004a, p. 585; 2004b, p. 674-675; Ministry of Economy, Trade and Industry, 2004c, p. 284-285).

Tungsten was one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of scheelite and wolframite powder. As of December 2004, the National Stockpile Program had 29.7 days' supply, or 70.8% of its target. During the past 21 years, the National Stockpile Program has never released or sold any tungsten in any form in any market conditions (Japan Oil, Gas and Metals National Corp., 2005b).

Vanadium.—Japan recovered vanadium pentoxide from petroleum residues, ashes, and spent catalysts. Estimated secondary production of vanadium pentoxide, in vanadium metal content, by Shinko Chemical Co. Ltd. and Taiyo Mining and Industry Co. Ltd. totaled between 890 and 1,000 t/yr during the 2001 to 2004 period. To meet the domestic requirements for its iron and steel industry, Japan imported 2,274 t of vanadium pentoxide valued at $26.5 million mainly from South Africa (52.8%) and China (47.2%). In 2004, imports of ferrovanadium totaled 5,518 t valued at $87.8 million mainly from South Africa (74.7%), Russia (7.6%), and Taiwan and China (5.4% each) (Ministry of Finance, 2004b, p. 183, 628).

Production of ferrovanadium decreased by 37.6% to 2,178 t in 2004 owing to the high production cost directly related to the high import price of vanadium pentoxide, which increased by 169% in 2004. Consumption of ferrovanadium by the steel manufacturers was 6,670 t in 2004. Exports of ferrovanadium totaled 77 t valued at about $1 million. The main buyers were South Africa (49.9%), Taiwan (31.7%) and Thailand (15.5%) in 2004 (Arumu Publishing Co. Ltd., 2005, p. 89; Ministry of Finance, 2004a, p. 500; Ministry of Economy, Trade and Industry, 2004c, p. 216).

Vanadium was one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of ferrovanadium nugget. As of December 2004, the National Stockpile Program had 21.4 days' supply, or 50.9% of its target. The National Stockpile Program released 80 t ferrovanadium between April and June 1998, 16.3 t in March 2004, 16.2 t in May 2004, and 97.9 t in November 2004. All ferrovanadium was sold during periods of rising prices (Japan Oil, Gas and Metals National Corp., 2005b).

Industrial Minerals

Cement.—In 2004, Japan was the world's fourth ranked cement producer and consumer after China, India, and the

United States (van Oss, 2005). The cement industry comprised 18 companies with about 3,550 workers and 33 cement plants concentrated in the areas of Chugoku and Kyushu, where most of Japan's limestone resources and limestone quarries are located (Ministry of Economy, Trade and Industry, 2004a, p.142, 145; Japan Cement Association, 2005§). Japan's cement industry's clinker capacity decreased to 76 Mt/yr from 81.4 Mt/yr in 2003. Production of cement clinker decreased to 65.4 Mt from 66.8 Mt in 2003, and production of cement decreased to 67.4 Mt from 68.8 Mt in 2003 because of continued weakness in the domestic demand for cement owing to cutbacks in public works spending.

Of the total cement produced in 2004, 51.3 Mt was portland cement, of which 47.8 Mt was ordinary portland cement and 3.5 Mt, high early-strength and moderate-heat portland cement; 15.3 Mt, blast-furnace slag cement; 120,000 t, fly ash cement; 70,000 t, white cement; and 552,000 t, other cement. The major raw materials consumed by the cement industry included 75.3 Mt of limestone, 9.9 Mt of clay, 5.7 Mt of silica stone, 5.2 Mt of blast furnace ore slag, and 2.6 Mt of gypsum. The cement industry consumed about 36,000 t of LPG and 1.6 billion kilowatts hours of electricity in 2004 (Ministry of Economy, Trade and Industry, 2004a, p. 76-80, 137, 142).

In 2004, cement shipments decreased by 1.8% to 66.8 Mt owing mainly to the decreased demand for portland cement. Exports of cement clinker increased slightly to 4.94 Mt valued at $93.8 million, and those of portland cement increased by 10.8% to 5.34 Mt valued at $116.2 million. The major buyers of cement clinker were China (27.1%), Hong Kong (23.9%), Australia (17.9%), Malaysia (10.2%), and Cote d'Ivoire (4.9%). The major buyers of portland cement were Singapore (26.6%), the Republic of Korea (23.3%), Hong Kong (16.4%), China (14.5%), Nigeria (7.2%), Taiwan (6.0%), Australia (2.3%). The average export free-on-board (f.o.b.) price of portland cement increased to $21.77 per ton in 2004 from $20.17 per ton in 2003 (Ministry of Finance, 2004a, p. 101). Japan imported only 3,653 t of cement clinker mainly from China (56.9%) and the United States (35.3%). Imports of portland cement totaled 815,400 t. The Republic of Korea was the dominant supplier and accounted for 97.2%. The average import c.i.f. price of portland cement increased to $39.01 per ton in 2004 from $36.15 per ton in 2003 (Ministry of Finance, 2004b, p. 168).

Taiheiyo Cement Corp., which was Japan's leading cement producer, had taken action in response to the continued decline in domestic demand for cement during the past 3 years. The company reportedly shut down the No. 5 kiln, one of two at the Saiki plant in Oita Prefecture in March 2002 and dissolved one of its cement manufacturing subsidiaries (Kawara Taiheiyo Cement Corp.) in Fukuoka Prefecture in March 2004 (Taiheiyo Cement Corp., 2005§).

Limestone.—Japan was one of the world's top limestone producers in 2004. Production decreased by 1.0% to 161.9 Mt, which was a new low since 1986; this was a result of decreased demand for the production of cement, ferroalloy, and steel in the manufacturing sector and for roads and concrete aggregate in the construction sector

Domestic limestone demand decreased by 1.2% to 153.6 Mt in 2004. Domestic limestone demand by end use was for cement (41.7%), concrete aggregate (21.9%), ferroalloys and steel smelting (15.0%), roads (5.3%), for making glass, refractories, and soda (0.7%), and other uses (15.4%) (Ministry of Economy, Trade and Industry, 2004d, p. 132, 135).

In 2004, Japan's imports of limestone flux, limestone, and other calcareous stone totaled 339,800 t valued at $12.3 Mt. The major suppliers were Malaysia (44.1%), Vietnam (28.6%), the Philippines (14.1%), and China (12.9%). Exports of limestone flux, limestone, and other calcareous stone totaled 2.99 Mt valued at $21.7 million. The major buyers were Taiwan (62.4%), Australia (19.2%), and the Republic of Korea (18.2%) (Ministry of Finance, 2004a, p. 101; 2004b, p. 168).

Mineral Fuels

Coal.—In 2004, Japan relied 100% on imports to meet its annual requirements for coking coal and anthracite, and about 99% to meet its annual requirements for steam (thermal) coal. Japan was the world's leading importer of steam coal mainly for consumption by the cement, paper, and utility industries. Japan also was the world's leading importer of coking coal for consumption by the iron and steel industry. Japan produced a small quantity of steam coal from several small-scale coal mines mainly in Hokkaido for consumption by the local power generation plants.

In 2004, coal was produced mainly by a 700,000-t/yr-capacity underground mine operated by Kushiro Coal Mine Co. Ltd., and 11 small-scale open pit mines (10 in Hokkaido Prefecture and 1 in Yamaguchi Prefecture). The Kushiro Mine was a center for transferring Japanese coal technology to large-scale coal-producing countries in Asia. Among the 11 small-scale coal mining companies, 2 in Hokkaido Prefecture were closed by the end of December and 2 in Hokkaido and 1 in Yamaguchi Prefecture were scheduled to be closed by the end of March 2005 (Japan Coal Energy Center, 2005).

In 2004, Japan's overall coal imports increased by 7.8% to 180.0 Mt valued at $10.11 billion, of which 118.3 Mt was bituminous coal (steam other than coking coal); 55.8 Mt, coking coal; and 5.9 Mt, anthracite. The major suppliers of coking coal were Australia (68.5%), Canada (9.5%), China (9.2%), the United States (6.1%), and Russia (5.7%); the major suppliers of bituminous coal (steam coal) were Australia (54.2%), Indonesia (21.1%), China (17.9%), and Russia (5.0%); and the major suppliers of anthracite were China (43.9%), Vietnam (43.1%), North Korea (4.4%), and Russia (4.3%) (Ministry of Finance, 2004b, p. 171).

To meet Japan's Kyoto Protocol commitments to slash greenhouse gas emissions, the Government of Japan began to levy a carbon tax on import coal at a rate of ¥230 per metric ton, or about $2.13 per metric ton on October 1, 2003. The coal import tax will be raised to ¥460 per ton on April 1, 2005, and further to ¥700 per ton on April 1, 2007 (Shinji, Tomita, Researcher, Planning and Coordination Department, Japan Coal Energy Center, written commun., May 20, 2005). The carbon tax was intended to depress demand for fossil fuels, such as coal, which produce greenhouse gases.

Natural Gas and Petroleum.—Japan was one of the world's leading consumers and importers of natural gas and crude petroleum. Domestic production of natural gas and crude petroleum was insignificant because of the country's limited indigenous oil and gas reserves. Japan's natural gas and crude petroleum reserves were estimated to be 39.6 billion cubic meters and 58.5 million barrels (Mbbl), respectively (Oil & Gas Journal, 2003). In 2004, domestic production of natural gas and crude petroleum totaled 2.88 billion cubic meters and 5.25 Mbbl, respectively, or about 4.5% of the 78.8 billion cubic meters of domestic natural gas consumption and 0.35% of the 1.5 billion barrels (Gbbl) of domestic crude petroleum consumption, respectively. In 2004, Japan imported 75.2 billion cubic meters of natural gas in the form of LNG and 1.53 Gbbl of crude petroleum (Ministry of Economy, Trade and Industry, 2004d, p. 26-27, 32-43, 78, 119).

According to the Ministry of Finance (2004b, p. 177) trade statistics, however, imports of LNG totaled 56.97 Mt (85.28 billion cubic meters) valued at $15.2 billion in 2004. The major suppliers of LNG were Indonesia (27.6%), Malaysia (21.7%), Australia (14.3%), Qatar (12.0%), Brunei (10.7%), the United Arab Emirates (9.3%), and the United States (2.2%). Crude petroleum imports were mainly from the Middle East (88.9%) and Southeast Asia (5.3). The major suppliers of crude petroleum were the United Arab Emirates (25.3%), Saudi Arabia (24.5%), Iran (15.0%), Qatar (9.3%), Kuwait (7.3%), Indonesia (3.5%), the Neutral Zone (of Kuwait and Saudi Arabia) (2.7%), Oman (2.4%), Iraq and Nigeria (2.2% each), and Sudan (1.8%). Imports of crude petroleum were valued at $55.9 billion (Ministry of Economy, Trade and Industry, 2004d, p. 28-34; Ministry of Finance, 2004b, p. 172-173).

In 2004, domestic demand for refined petroleum, by product, was as follows: gasoline, 385.1 Mbbl; heavy fuel oil, 354.2 Mbbl; naphtha, 304.5 Mbbl; diesel (distillate fuel oil), 239.5 Mbbl; kerosene, 172.4 Mbbl; jet fuel, 30.4 Mbbl; asphalt, 22.8 Mbbl; lubricants, 13 Mbbl; and paraffin wax, 406,000 barrels (bbl). To meet its domestic demand, Japan imported a total of 233 Mbbl of refined petroleum products in 2004. The imported refined petroleum products included 184.5 Mbbl of naphtha, 8.9 Mbbl of kerosene, 16.8 Mbbl of heavy fuel oil, 17.1 Mbbl of gasoline, 3.4 Mbbl of diesel, 2.3 Mbbl of jet fuel, 296,000 bbl of lubricants, and 47,000 bbl of paraffin wax (Ministry of Economy, Trade and Industry, 2004d, p. 80-81).

In 2004, consumption of domestically produced natural gas was follows: gas (51.3%), electric power (15.2%), oil and gas (14.9%), chemical (12.6%), and other manufacturing and service (6.0%) industries. Of the 50.2 Mt (75.2 billion cubic meters) of imported natural gas in the form of LNG, 70% was consumed by the electric power industry for power generation and 30% was for gas and industrial use (Ministry of Economy, Trade and Industry, 2004d, p. 26, 118).

At the end of 2004, Japan's stockpile of crude petroleum and partially refined and refined petroleum products totaled 172 days' supply—91 days in the national (Government-owned) stockpile and 81 days in the private (privately owned) stockpile (Ministry of Economy, Trade and Industry, 2004d, p. 142-143).

Reserves

Japan's reserves of limestone and other industrial minerals, such as dolomite, iodine, pyrophyllite, and silica stone, are large. Coal reserves are not large and are very costly to produce. With the exception of gold, ore reserves for metallic minerals and other minerals, especially oil and gas, are negligible (table 3).

Infrastructure

Japan had one of the most modern and complete infrastructures for its mining and mineral-processing industries in the world. Despite its small land area, Japan had a highway system of 1.17 million kilometers, of which 903,300 km was paved and 268,300 km, unpaved. The railroad network had 23,600 km, of which 16,500 was electrified. Highway and railroad networks link all major seaports and all coastal cities on the four major islands. The networks also connect Honshu to Kyushu and Shikoku Islands in the south and Hokkaido Island in the north by means of bridges and tunnels.

Japan's domestic and international telecommunication services were among the best in the world with land and mobile phone services; satellite earth stations [five Intelsat (four in the Pacific Ocean and one in the Indian Ocean), one Intersputnik (in the Indian Ocean), and one Inmarsat (in the Indian and the Pacific Oceans)]; submarine cables to China, the Philippines, Russia, and the United States (via Guam); and 73 Internet service providers (as of 2000) and 12,962,000 internet hosts (2003). For electric power generation, Japan had 4,683 powerplants with a total capacity of 266.1 million kilowatts (as of 2002). For electric power transmission, Japan had a route length of 94,000 km and a circuit length of 166,000 km (as of 2002). For power distribution, Japan's total length of line distances, which included high- and low-voltage, was 1,255,000 km (as of 2002) concentrated in the major industrial areas of Fukuoka, Hiroshima, Nagoya, Osaka, Takamatsu, Tokyo, and Toyama. Japan also had an extensive pipeline system that comprised 2,719 km for natural gas, 170 km for oil, and 60 km for oil, gas, and water (as of 2003).

Japan had 27 major ports to receive raw materials from overseas and to export manufactured products. The major port facilities, which included terminals and warehouses, were among the most indispensable parts of the infrastructure for the mineral industry because of their roles in receiving imported raw materials, such as coal, crude petroleum, iron ore, LNG, nonferrous ore, and phosphate rock for mineral-processing plants and powerplants and exporting value-added mineral and metal products. The important seaports of the major mineral-processing centers were Akita, Amagasaki, Chiba, Hachinohe, Higashi-Harima, Himeji, Hiroshima, Kawasaki, Kobe, Mizushima, Nagoya, Osaka, Sakai, Shimizu, Tokyo, and Yokohama on Honshu; Fukuoka, Kita Kyushu, Moji, and Oita on Kyushu; Hakodate, Kushiro, Muroran, and Tomakomai on Hokkaido; and Sakaide on Shikoku.

Japan had 174 airports and 15 heliports in 2004. The major international airports were Fukuoka, Haneda (Tokyo), Kansai, Nagoya, Narita (New Tokyo), and Osaka. Japan's round-the-clock airport, Kansai International, sits on reclaimed offshore land in Osaka Bay.

Outlook

Japan's economy has been forecasted to continue to grow in 2005 but at a slower pace (0.8%) and then to grow at a faster pace (1.9%) in 2006 (International Monetary Fund, 2005§). Domestic mining activities during the next 2 years are expected to hold steady or decline slightly in the industrial minerals and lead, silver, and zinc production mainly because of the depleting ore reserves. Metal production of copper and zinc is expected to hold steady or increase slightly as domestic demand for the metals continues its upward trend in 2005. During the next 2 years, production of crude steel is expected to remain within a narrow range of between 112 and 113 Mt because of the continued strong demands from the Japanese automobile and machinery and equipment sectors and an anticipated high level of exports to such Asian countries as China, the Republic of Korea, Taiwan, and Thailand. Production of titanium sponge metal is expected to increase considerably because of the continuing strong domestic demand and increasing orders coming from the EU. Production of cement and limestone is expected to hold steady or decrease slightly owing to anticipated cutbacks in public works spending.

To sustain its economic health and to prevent another economic recession, Japan is expected to continue exporting more ferrous and nonferrous metals and cement clinker and cement to ASEAN countries, China, the Republic of Korea, and Taiwan where the economies are expected to continue to improve in the coming years. Imports of coal, iron ore, nonferrous metals, and other minerals are expected to increase during the next 2 years as the consumption of raw materials trends upward in the iron and steel, nonferrous metals, and utility industries.

In line with its mineral policy to secure and diversify its long-term supply of raw materials, which will ensure a steady economic growth, Japan is expected to continue its active search for direct investment in joint exploration and development of minerals in developed and developing countries, especially in Australia, Canada, Chile, China, Indonesia, Mexico, Peru, the Philippines, and the United States. The targeted minerals were antimony, chromium, coal, columbium (niobium), copper, gold, iron ore, lead, lithium, manganese, molybdenum, natural gas, nickel, crude petroleum, rare earths, silver, strontium, tantalum, titanium, tungsten, vanadium, and zinc.

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TABLE 1
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS						
Aluminum:						
Alumina	thousand metric tons	369	331	333	363 [r]	340 [e]
Aluminum hydroxide	do.	782	739	724	740	730 [e]
Metal:						
Primary:						
Regular grades	do.	7	7	6	6	6
High-purity	do.	41	27	40	44	55
Secondary[2]	do.	1,214	1,171	1,239	1,261 [r]	1,015
Antimony:						
Oxide		11,051	8,789	9,052	8,190 [r]	8,716
Metal		146	101	183	121	222
Arsenic, high-purity[e]		100	100	100	100	100
Bismuth		520	551	474	513	522
Cadmium, refined		2,472	2,460	2,444	2,509	2,233
Chromium, metal[e]		750	1,350	1,600	1,500	1,600
Cobalt, metal		311	350	354	379	429
Copper:						
Mine output, Cu content		1,211	744	--	--	--
Metal:						
Blister and anode:						
Primary		1,331,352	1,328,489	1,317,291	1,343,353	1,270,995
Secondary		149,282	139,764	182,069	172,724	194,927
Total		1,480,634	1,468,253	1,499,360	1,516,077	1,465,922
Refined:						
Primary		1,290,091	1,287,165	1,211,111	1,251,728	1,188,491
Secondary		147,260	138,526	189,968	178,637	191,653
Total		1,437,351	1,425,691	1,401,079	1,430,365	1,380,144
Gallium, metal:						
Primary[e]		14	8	8	9	9
Secondary		56	62	80	83	81
Germanium:						
Oxide[e]		10	10	20 [r]	30 [r]	50
Metal	kilograms	1,809	1,615	803	621	943
Gold:						
Mine output, Au content	do.	8,400	7,815	8,615	8,143	8,021
Metal:						
Primary	do.	146,061	155,826	144,748	161,399	136,616
Secondary[3]	do.	19,280	19,831	21,160	22,549	23,183
Total	do.	165,341	175,657	165,908	183,948	159,799
Indium, metal[e]	do.	55,078 [4]	55,000	60,000	70,000	70,000
Iron and steel:						
Iron ore and iron sand concentrate:						
Gross weight		1,454	750	-- [r, e]	-- [r, e]	-- [e]
Fe content		523	258	-- [r, e]	-- [r, e]	-- [e]
Metal:						
Pig iron and blast furnace ferroalloys	thousand metric tons	81,071	78,836	80,979	82,091	82,974

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS--Continued						
Iron and steel--Continued:						
Metal--Continued:						
Electric-furnace ferroalloys:						
Ferrochrome		130,074	111,167	91,937	19,427	13,472
Ferromanganese		337,694	368,293	356,717	371,831	437,389
Ferronickel		367,181	367,739	370,973	369,099	374,213
Silicomanganese		67,926	62,238	70,965	58,043	73,041
Other:						
Ferromolybdenum		3,699	3,485	2,375	2,691	3,323
Ferrotungsten		42	109	9	12	--
Ferrovanadium		4,108	3,613	3,592	3,491	2,178
Unspecified		7,171	5,733	6,376	3,813	7,321
Total		917,895	922,377	902,944	828,407	910,937
Steel, crude	thousand metric tons	106,444	102,866	107,745	110,511	112,718
Semimanufactures, hot-rolled:						
Ordinary steels	do.	83,044	78,927	80,838	81,769	83,354
Special steels	do.	15,747	15,835	17,451	18,735	19,843
Lead:						
Mine output, Pb content		8,835	4,997	5,723	5,660	5,512
Metal, refined:						
Primary		129,469	127,358	107,744	105,460	94,272
Secondary		182,209	175,088	178,016	189,831	188,601
Total		311,678	302,446	285,760	295,291	282,873
Magnesium, metal, secondary[e]		10,000	10,000	9,000	10,000	10,000
Manganese, oxide		63,379	51,095	45,867	49,115	45,680
Molybdenum, metal		626	610	465	561	812
Nickel metal:						
Refined		36,230	32,526	32,303	34,991	32,769
Ni content of nickel oxide sinter		47,020	49,600	48,950	52,663 [r]	60,285
Ni content of ferronickel		74,753	68,113	74,418	75,399 [r]	74,261
Ni content of chemical		2,721	2,394	1,820	2,084	2,082
Total		160,724	152,633	157,491	165,137 [r]	169,397
Platinum-group metals:						
Palladium, metal	kilograms	4,712	4,805	5,618	5,500 [e]	5,300 [e]
Platinum, metal	do.	782	791	762	770 [e]	750 [e]
Rare-earth oxides[5]		5,619	5,109	5,423	5,521	6,015
Selenium, metal		612	735	752	734	599
Silicon, high-purity		4,688	4,334	4,453 [r]	5,045	6,135
Silver:						
Mine output, Ag content	kilograms	103,781	80,397	81,416	78,862	75,689
Metal:						
Primary	do.	2,384,739	2,293,028	2,259,551	2,453,204	2,208,270
Secondary[3]	do.	345,358	303,804	291,955	258,754	219,047
Total	do.	2,730,097	2,596,832	2,551,506	2,711,958	2,427,317
Tantalum, metal[e]		85	90	90	95	95
Tellurium, metal		36	39	29	33	33
Tin, metal, smelter		593	668	659	662	707

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS--Continued						
Titanium:						
Dioxide		270,272	256,961	240,469	253,453	253,364
Metal		19,457	24,906	25,199	18,923	23,500 [e]
Tungsten, metal		4,993	3,607	3,302	3,333	4,166
Vanadium, metal[e, 6]		890 [r]	890 [r]	1,000 [r]	1,000 [r]	1,000
Zinc:						
Mine output, Zn content		63,601	44,519	42,851	44,574	47,781
Oxide		82,816	75,414	74,515	75,090	75,813
Metal:						
Primary		541,704	541,277	547,183	532,704	534,830
Secondary		157,047	142,777	126,723	153,411	132,417
Total		698,751	684,054	673,906	686,115	667,247
Zirconium, oxide		8,540	7,930	8,650	8,800	9,800
INDUSTRIAL MINERALS						
Asbestos[e]		-- [r]	-- [r]	-- [r]	-- [r]	--
Bromine[e]		15,000	15,000	20,000	20,000	20,000
Cement, hydraulic	thousand metric tons	81,097	76,550	71,828	68,766	67,376
Clays:						
Bentonite		415,115	415,102 [r]	437,772	425,945	455,282
Fire clay, crude		506,314	475,665	480,000 [e]	460,000 [e]	470,000 [e]
Kaolin		25,739	17,240 [r]	11,756	12,409	11,553
Diatomite		136,400 [r]	132,100 [r]	111,190 [r]	129,300 [r]	130,000 [e]
Feldspar and related materials:[e]						
Feldspar		52,000	50,000	50,000	50,000	50,000
Aplite		330,000	310,000	403,000	300,000	310,000
Gypsum	thousand metric tons	5,917	5,874	5,644	5,764	5,865
Iodine		6,157	6,643	6,548	6,524	7,264
Lime, quicklime	thousand metric tons	8,106	7,586	7,420	7,953	8,507
Nitrogen, N content of ammonia	do.	1,410	1,318	1,192	1,061	1,101
Perlite[e]		250,000	255,000	250,000	250,000	200,000
Salt, all types	thousand metric tons	1,374	1,358	1,282	1,263	1,225
Silica:						
Sand	do.	6,121	5,768	4,893	4,699	4,705
Stone, quartzite	do.	15,578	14,213	13,568	12,838	12,218
Sodium compounds, n.e.s.:						
Soda ash		669,203	461,204	410,000	400,000	400,000
Sulfate, anhydrous		163,057	146,780	137,713	132,807	130,107
Stone, crushed:						
Dolomite	thousand metric tons	3,539	3,389	3,450	3,579	3,727
Limestone	do.	185,569	182,255	170,166	163,565	161,858
Sulfur:						
S content of pyrite	do.	-- [r]	-- [r]	-- [r]	-- [r]	--
Byproduct of metallurgy	do.	1,384	1,319	1,326	1,281	1,263
Byproduct of petroleum	do.	2,071	2,024	1,865	1,951	1,895
Talc and related materials:						
Talc[e]		50,000	45,000	40,000	40,000	42,000
Pyrophyllite		692,998	623,097	600,000 [e]	600,000 [e]	610,000 [e]
Vermiculite[e]		7,000 [r]	6,500 [r]	6,400 [r]	6,200 [r]	6,200

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	thousand metric tons	788	742	755	788	804
Coal, bituminous[7]	do.	3,126	3,208 [r]	1,368 [r]	1,338 [r]	1,339
Coke including breeze:						
Metallurgical	do.	38,394	38,402	38,417	38,544	38,314
Gas, natural:						
Gross[8]	million cubic meters	2,453	2,521	2,571	2,844	2,883
Marketed	do.	2,507	2,602	2,662	3,011	3,021
Petroleum:						
Crude	thousand 42-gallon barrels	4,656	4,782	4,548	5,161	5,247
Refinery products:						
Gasoline:						
Aviation[e]	do.	45	40	40	50	50
Other	do.	356,530	364,714	364,129	367,687	366,662
Asphalt and bitumen	do.	33,366	33,151	31,537	32,586	34,475
Distillate fuel oil	do.	268,022	261,851	250,932	242,311	243,425
Jet fuel	do.	66,828	67,320	65,263	60,013	64,846
Kerosene	do.	175,399	176,655	169,472	177,963	167,348
Liquefied petroleum gas	do.	57,251	59,942	53,593	53,107	50,881
Lubricants	do.	16,677	16,304	16,630	16,314	16,561
Naphtha	do.	112,935	116,122	119,298	122,355	125,252
Paraffin, wax	do.	855	822	833	915	902
Petroleum coke	do.	4,274	4,700	4,549	4,000	4,533
Refinery fuel and losses[e, 9]	do.	150,000	150,000	150,000	150,000	150,000
Residual fuel oil	do.	429,153	409,780	398,673	435,763	406,901
Unfinished oils[e]	do.	50,000	50,000	50,000	50,000	50,000
Total[10]	do.	1,720,000	1,710,000	1,670,000	1,710,000	1,680,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. -- Zero.

[1] Table includes data available through October 28, 2005.

[2] Includes unalloyed and alloyed ingot.

[3] Includes recovered from scrap and waste.

[4] Reported figure.

[5] Includes oxide of cerium, europium, gadolinium, lanthanum, neodymium, praseodymium, samarium, terbium, and yttrium.

[6] Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.

[7] All major coal mines had closed by January 2002, but 12 smaller mines were still in operation in 2004.

[8] Includes output from gas wells and coal mines.

[9] May include some additional unfinished oils.

[10] Data are rounded to three significant digits; may not add to totals shown.

Sources: Ministry of Economy, Trade and Industry, Yearbook of Iron and Steel, Non-ferrous Metal, and Fabricated Metals Statistics, 2004; Yearbook of Chemical Industries Statistics, 2004; Yearbook of Ceramics and Building Materials Statistics, 2004; and Yearbook of Mineral Resources and Petroleum Products Statistics, 2004. Japan Aluminum Association, Aluminum Statistics, 2004. Arumu Publishing Co. Ltd., Industrial Rare Metals Annual Review No. 121, 2005. U.S. Geological Survey Minerals Questionnaire, 2000-04.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Aso Cement Co. Ltd.	Tagawa and Kanda, Fukuoka Prefecture	2,400
Do.		Daiichi Cement Co. Ltd.	Kawasaki, Kanagawa Prefecture	1,169
Do.		Denki Kagaku K.K.	Omi, Niigata Prefecture	2,762
Do.		Hachinohe Cement Co. Ltd.	Hachinohe, Aomori Prefecture	1,533
Do.		Hitachi Cement Co. Ltd.	Hitachi, Ibaraki Prefecture	941
Do.		Mitsubishi Materials Corp.	Higashidori, Shimokita-gun, Apmori Prefecture; Higashiyama, Higashiiwai-gun, Iwate Prefecture; Yokoze, Saitama Prefecture; Kurosaki, Kyushu, and Higashitani, Fukuoka Prefecture	13,467
Do.		Mitsui Mining Co. Ltd.	Togawa, Fukuoka Prefecture	2,075
Do.		Myojo Cement Co. Ltd.	Itoigawa, Niigata Prefecture	2,482
Do.		Nippon Steel Chemical Co. Ltd.	Tobata, Kitakyushu, Fukuoka Prefecture	855
Do.		Nittetsu Cement Co. Ltd.	Muroran, Hokkaido Prefecture	1,589
Do.		Ryukyu Cement Co. Ltd.	Yabu, Nago, Okinawa Prefecture	722
Do.		Sumitomo Osaka Cement Co. Ltd.	Tamura, Fukushima Prefecture; Aso, Tochigi Prefecture; Motosu, Gifu Prefecture; Sakata, Shiga Prefecture; Ako, Hyogo Prefecture; and Susaki, Kochi Prefecture	14,402
Do.		Taiheiyo Cement Corp.	Ofunato, Iwate Prefecture; Chichibu, Kumagaya, and Saitama, Saitama Prefecture; Fujiwara, Mie Prefecture; Saiki and Tsukumi, Oita Prefecture; Kamiiso, Hokkaido Prefecture; and Tosa, Kochi Precture	28,800
Do.		Tokuyama Cement Co. Ltd.	Nanyo, Yamaguchi Prefecture	5,936
Do.		Tosoh Corp.	Shin Nanyo, Yamaguchi Prefecture	2,869
Do.		Tsuruga Cement Co. Ltd.	Tsuruga, Fukui Prefecture	1,710
Do.		Ube Industries Ltd.	Ube, Isa, Yamaguchi Prefecture; and Kanda, Fukuoka Prefecture	10,736
Coal		Kushiro Coal Mine Co. Ltd.[1]	Kushiro, Hokkaido Prefecture	750
Cobalt, refined	metric tons	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	600
Copper, refined	do.	Hibi Kyodo Smelting Co. Ltd. (Mitsui Mining & Smelting Co. Ltd., 64%; Nittetsu Mining Co. Ltd., 20%; Furukawa Co. Ltd., 16%)	Tamano, Okayama Prefecture	218,400
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	225,600
Do.	do.	Nippon Mining & Metals Co. Ltd. (wholly owned subsidiary of Nikko Kyodo Co. Ltd.)	Hitachi, Ibaraki Prefecture; Saganoseki, Oita Prefecture	452,400
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Dowa Mining Co. Ltd., 31.15%; Furukawa Co. Ltd., 8.31%; Furukawa Electric Co. Ltd., 4.17%; Mitsubushi Materials Corp., 49.29%; Mitsubishi Cable Indutries, Ltd., 4.17%; others, 2.91%)	Onahama, Fukushima Prefecture	258,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Besshi/Toyo (Saijyo), Ehime Prefecture	300,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	72,000
Gold:				
In concentrate	kilograms	Sumitomo Metal Mining Co. Ltd.	Hishikari, Kagoshima Prefecture	9,000
Refined	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	24,000
Do.	do.	Mitsui Mining & Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	22,000
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.	do.	Nippon Mining & Metals Co. Ltd.	Hitachi, Ibaraki Prefecture	30,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

TABLE 2--Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Limestone		Mitsubishi Materials Corp.	Higashitani, Fukuoka Prefecture	10,000
Do.		Nittetsu Mining Co. Ltd.	Torigatayama, Kochi Prefecture; Hanezuru, Tochigi Prefecture; and Shiriya, Aomori Prefecture	23,000
Do.		Sumikin Mining Co., Ltd.	Hachinohe Sekkai, Aomori Prefecture	5,500
Do.		Sumitomo-Osaka Cement Co. Ltd.	Ibuku, Shiga Prefecture, and Karazawa, Tochigi Prefecture	4,000
Do.		Shuho Mining Co., Ltd.	Sumitomo Cement Shuho, Yamaguchi Prefecture	8,200
Do.		Taiheiyo Cement Co. Ltd.	Ofunato, Iwate Prefecture; Ganji and Tsukumi, Oita Prefecture; Garo, Hokkaido Prefecture; Kawara, Fukuoka Prefecture, Tosayama, Kochi Prefecture; Taiheiyo Buko, Saitama Prefecture; and Shigeyasu, Yamaguchi Prefecture	46,000
Do.		Todaka Mining Co. Ltd.	Todaka-Tsukumi, Otia Prefecture	12,000
Do.		Ube Kosan Co. Ltd.	Ube Isa, Yamaguchi Prefecture	9,000
Iodine, crude	metric tons	Ise Chemical Industries Co. Ltd. (Asahi Glass Co. Ltd., 52.4%, and Mitsubishi Corp., 11.2%)	Oami-Shirasato, and Ichinomya, Chiba Prefecture; and Sadowara, Miyazaki Prefecture	3,600
Do.	do.	Godo Shigen Sangyo Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 11%, and Mitsui & Co. Ltd., 10%)	Chosei, Chiba Prefecture	2,400
Do.	do.	Kanto Natural Gas Development Co. Ltd. (Mitsui Chemicals, Inc., 21.9%, and Godo Shigen Sangyo Co. Ltd., 14.3%)	Mobara, Chiba Prefecture	1,200
Do.	do.	Nihon Tennen Gas Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 50%, and Tomen Corp., 41%)	Shirako and Yokoshiba, Chiba Prefecture	1,200
Do.	do.	Toho Earthtech, Inc. (Itochi Corp., 34.1%; Mitsubishi Gas Chemical Co. Ltd., 32.2%; Nippon Light Metal Co. Ltd., 31.1%)	Kurosaki, Niigata Prefecture	720
Do.	do.	Nippoh Chemicals Co. Ltd. (Nippon Shokubai Co. Ltd., 17%; Takeda Chemical Industries Ltd., 16.4%; Chugai Boyeki Co. Ltd., 13.6%)	Isumi, Chiba Prefecture	720
Lead:				
In concentrate		Toyoha Mining Co. Ltd. (wholly owned subsidiary of Nippon Mining & Metals Co. Ltd.)[2]	Toyoha, Hokkaido Prefecture	6
Refined	metric tons	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	33,600
Do.	do.	Mitsui Mining & Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	43,800
Do.	do.	Toho Zinc Co. Ltd.	Chigirishima, Hiroshima Prefecture	120,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	30,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd.	Kosaka, Akita Prefecture	25,200
Do.	do.	Hosokura Smelting and Refining Mining Co. Ltd. (wholly owned subsidiary of Mitsubishi Materials Corp.)	Hosokura, Miyagi Prefecture	22,200
Manganese, electrolytic dioxide		Mitsui Mining & Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	24
Do.		Tosoh Corp.	Hyuga, Miyazaki Prefecture	32
Nickel:				
In ferronickel	metric tons	Hyuga Smelting Co. Ltd. (wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd.)	Hyuga, Miyazaki Prefecture	21,000
Do.	do.	Nippon Yakin Kogyo Co. Ltd.	Oheyama, Kyoto Prefecture	12,720
Do.	do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	40,800
In oxide	do.	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	60,000
Refined	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

TABLE 2--Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Pyrophyllite		Goto Kozan Co. Ltd.	Goto, Nagasaki Prefecture	204
Do.		Ohira Kozan Co. Ltd.	Ohira, Okayama Prefecture	132
Do.		Sankin Kogyo Co. Ltd.	Otsue, Hiroshima Prefecture	72
Do.		Shinagawa Shirenga Co. Ltd.	Mitsuishi, Okayama Prefecture	180
Do.		Shokozan Kogyosho Co. Ltd.	Yano-Shokozan, Hiroshima Prefecture	180
Do.		Showa Kogyo Co. Ltd.	Showa-Shokozan, Hiroshima Prefecture	60
Steel, crude		JFE Steel Corp. (wholly owned subsidiary of JFE Holdings Inc.)	Chiba, Chiba Prefecture; Kawasaki (Keihin), Kanagawa Prefecture; Nishinomiya, Hyogo Prefecture; Handa Aichi Prefecture; Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture	33,835
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,943
Do.		Nippon Steel Corp.	Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	33,199
Do.		Sumitomo Metal Industries, Ltd.	Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	12,820
Titanium:				
In sponge metal		Sumitomo Titanium Corp. (Sumitomo Metal Industries Ltd., 75.2%, and Kobe Steel Ltd., 24.8%)	Amagasaki, Hyogo Prefecture	18
Do.		Toho Titanium Co. Ltd. (Nippon Mining & Metals Co. Ltd., 47%; Mitsui & Co. Ltd., 20%; others, 33%)	Chigasaki, Kanagawa Prefecture	13
In dioxide	metric tons	Fuji Titanium Industry Co. Ltd. (Ishihara Sangyo Kaishia Ltd., 24.8%, and others, 75.2%)	Kobe, Hyogo Prefecture	17,400
Do.	do.	Furukawa Co. Ltd.	Osaka, Osaka Prefecture	13,200
Do.	do.	Ishihara Sangyo Kaisha Ltd.	Yokkaichi, Mie Prefecture	154,800
Do.	do.	Sakai Chemical Industries Co. Ltd.	Onahama, Fukushima Prefecture	60,000
Do.	do.	Tayca Corp.	Saidaiji, Okayama Prefecture	60,000
Do.	do.	Titan Kogyo Kabushiki Kaisha	Ube, Yamaguchi Prefecture	16,800
Do.	do.	Tohkem Products Corp.	Akita, Akita Prefecture	30,000
Zinc:				
In concentrate		Toyoha Mining Co. Ltd.[2]	Toyoha, Hokkaido Prefecture	48
Refined	metric tons	Akita Smelting Co. Ltd. (Dowa Mining Co. Ltd., 57%; Nippon Mining & Metals Co. Ltd., 24%; Sumitomo Metal Mining Co. Ltd., 14%; Mitsubushi Materials Corp., 5%)	Iijima, Akita Prefecture	200,400
Do.	do.	Hachinohe Smelting Co. Ltd. (Mitsui Mining & Smelting Co. Ltd., 57.7%; Nippon Mining & Metals Co. Ltd., 27.8%; and Toho Zinc Co. Ltd. and Nisso Smelting Co. Ltd., 14.5%)	Hachinohe, Aomori Prefecture	117,600
Do.	do.	Hikoshima Smelting Co. Ltd.	Hikoshima, Yamaguchi Prefecture	84,000
Do.	do.	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	72,000
Do.	do.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,200
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	90,000

[1] Coal mining operation continued following establishment of Kushiro Coal Mining Co. Ltd. in 2002.

[2] Lead and zinc mining operations at the Toyoha Mine were scheduled to cease by the end of March 2006.

TABLE 3
JAPAN: RESERVES OF MAJOR MINERAL COMMODITES IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Coal[1]		785,000
Copper ore, Cu content		36
Dolomite[2]		1,400,000
Gold ore, Au content	kilograms	179,000
Iodine		5,000 [e]
Lead ore, Pb content		623
Kaolin		35,000
Limestone[3]		60,700,000
Pyrophyllite		160,000
Silica sand[4]		201,000
Silica stone, white[5]		881,000
Silver ore, Ag content		2,390
Zinc ore, Zn content		3,250

[e] Estimated.

[1] Recoverable reserves, which include 17 million metric tons of lignite.

[2] Average ore grade is 17.9% MgO.

[3] Average ore grade is 53.8% CaO.

[4] Average ore grade is 78.0% SiO_2.

[5] Average ore grade is 92.8% SiO_2.

Sources: Research Institute of Economy, Trade and Industry.

TABLE 4
JAPAN: MINERALS TRADE[1]

(Million dollars)

		Imports			Exports		
Code	Commodity	2002	2003	2004	2002	2003	2004
25	Salt, sulfur, earths and stone, lime, plastering materials, cement	1,176	1,220	1,391	301	374	399
26	Ferrous and nonferrous metal ores, slag, ash	6,511	7,482	10,221	30	40	70
27	Mineral fuels, mineral oils, and products of their distillation; bituminous substances; mineral waxes	65,664	81,054	99,421	1,403	1,555	2,287
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements, or of isotopes	2,942	3,458	4,339	1,934	2,292	2,706
31	Fertilizers	526	530	641	84	86	103
68	Articles of stone, plaster, cement, asbestos, mica, or similar materials	1,085	1,150	1,168	855	1,016	1,251
69	Ceramic products	647	760	880	860	912	1,089
70	Glass and glassware	1,202	1,362	1,752	2,413	2,788	3,456
71	Natural or cultured pearls; precious or semi-precious stones; precious metals, metals clad with precious metals and articles thereof; imitation jewellery; coins	5,698	5,705	7,685	1,636	2,149	2,491
72	Iron and steel	2,185	3,093	5,258	13,160	15,717	21,187
73	Articles of iron and steel	2,455	2,852	3,524	5,821	6,225	7,678
74	Copper and articles thereof	692	761	1,196	2,270	2,388	3,199
75	Nickel and articles thereof	927	1,384	2,187	324	458	786
76	Aluminum and articles thereof	4,533	5,447	6,592	1,434	1,722	1,965
78	Lead and articles thereof	19	18	26	20	18	27
79	Zinc and articles thereof	41	63	78	107	89	105
80	Tin and articles thereof	113	156	297	53	56	85
81	Other base metals, cermets, articles thereof	622	840	1,685	540	643	859
	Total	97,038	117,335	148,341	33,245	38,528	49,743
	Total trade	337,550	382,761	454,867	416,538	470,650	565,342

[1] Values have been converted from Japanese yen (¥) to U.S. dollars (US$) at a rate of ¥125.1=US$1.00 for 2002, ¥115.9=US$1.00 for 2003, and ¥108.2=US$1.00 for 2004.

Source: Ministry of Finance, Japan Exports & Imports, Commodity by Country, December 2002-2004.

TABLE 5
JAPAN: OVERSEAS ALUMINUM SMELTING PROJECTS, AN UPDATE IN 2004

Company/project name and country	Annual capacity (metric tons) Total	Annual capacity (metric tons) Japanese share	Type of power	Production started	Shipment to Japan started	Major equity holder and/or other holders	Participating Japanese companies and their equity share
New Zealand Aluminium Smelters Ltd., New Zealand	313,000	67,600	Hydro	April 1971	July 1971	Comalco New Zealand Ltd., 79.36%	Sumitomo Chemical Co. Ltd., 20.64%.
Alcan Smelters and Chemical Ltd., Canada	90,000	45,000	do.	NA	January 1977	Alcan Aluminum Ltd. of Canada, 50%	Nippon Light Metal Co. Ltd., 50%.
Intalco Aluminum Corp.[1] United States	272,000	106,000	do.	1966	NA	Alcoa Inc., 61%	Mitsui & Co., Ltd., 32%, and YKK Corp., 7%.
Eastalco Aluminum Co.,[1] United States	174,000	68,000	Thermal	1970	do.	do.	do.
Industria Venezolana de Aluminio C.A., Venezuela	450,000	90,000	Hydro	February 1978	December 1978	Corp. Venezolana de Guayana (CVG), of Venezuela, 80%	Showa Denko K.K., 7%; Sumitomo Chemical Co. Ltd., 4%; Kobe Steel Ltd., 4%; Mitsubishi Materials Corp., 3%; Mitsubishi Aluminum Co. Ltd., 1%; Marubeni Corp., 1%.
P.T. Indonesia Asahan Aluminum, Indonesia	225,000	133,000	do.	February 1982	October 1982	Indonesian Government, 41%	Nippon Asahan Aluminium Co. Ltd. (a 13-member Japanese consortium), 59%.
Boyne Island Smelter Ltd., reduction lines 1, 2, Australia	260,000	130,000	Thermal	do.	July 1982	Comalco Ltd. of Australia, 59.5%	Sumitomo Light Metal Co. Ltd., 17%; Ryowa Development Pty. Ltd., 9.5%; YKK Aluminum Pty. Ltd., 9.5%; Sumitomo Chemical Co. Ltd., 4.5%.
Boyne Island Smelter Ltd., reduction line 3, Australia	230,000	94,000	do.	July 1997	October 1997	Comalco Ltd. of Australia, 59.25%	Sumitomo Light Metal No. 2 Co. Pty. Ltd., 17%; Ryowa Development II Pty. Ltd., 14.25%; YKK Aluminium Pty. Ltd., 9.5%.
Alcoa of Australia Ltd., Australia	350,000	80,500	do.	November 1986	NA	Alcoa of Australia, 45%; Eastern Aluminum Co., 10%; China International Trust & Investment Corp., 22%	Marubeni Corp., 23%.
Aluminio Brasileiro S.A., Brazil	400,000	196,000	Hydro	July 1985	November 1986	Companhia Vale do Rio Doce, 51%	Nippon Amazon Aluminum Co. (a 32-member Japanese consortium), 49%.
Mozambique Aluminum Co.,[2] Mozambique	503,000	126,000	do.	June 2000	NA	Billiton plc, 47.11%; Industrial Development Corp. of South Africa, 24.04%; the Government of Mozambique, 3.85%	Mitsubishi Corp., 25%.
Aluminerie Alouette Inc.,[3] Canada	243,000	46,000	do.	June 1992	September 1992	Alcan, 40%; Austria Metal AG, 20%; Hydro Aluminium, 20%; Societe Generale de Financement du Quebec, 13.33%	Marubeni Corp., 6.67%.

NA not available.

[1] The two smelters under Intalco Aluminum Corp. and Eastalco Aluminum Co. were acquired by Alcoa Inc. in July 1998.

[2] Phase 2 was compelted and added an additional 253,000 metric tons per year (t/yr) of aluminum capacity in October 2003.

[3] Capacity will be expanded to 500,000 t/yr in fall 2005 from 243,000 t/yr.

Source: Japan Aluminum Association, Japan Overseas Aluminun Smelting Projects; U.S. Geological Survey, Primary Aluminum Plants Worldwide—1998, Part I—Detail, p. 4, 22, and 155; Marubeni Corp.

TABLE 6
JAPAN: DEMAND FOR GOLD AND SILVER

Item		2000	2001	2002	2003	2004
Gold:						
Dental and medical	kilograms	21,221	20,813	21,765	22,373	21,383
Electrical, electronic, and communication	do.	106,086	70,916	80,415	85,112	86,315
Gold plating	do.	24,993	22,615	22,513	23,512	23,612
Jewelry	do.	43,119	37,512	37,128	20,489	20,189
Decorations and badges	do.	1,678	1,474	1,392	1,499	1,412
Pottery and porcelain	do.	1,005	975	1,149	1,532	1,420
Fountain pens	do.	12	14	15	15	--
Watches	do.	768	778	785	790	786
Industrial arts and crafts	do.	4,222	4,893	4,697	4,879	4,653
Private hoarding	do.	52,417	69,586	85,569	79,481	80,526
Other	do.	39,257	32,919	47,755	48,317	48,180
Total	do.	294,778	262,495	303,183	287,999	289,598
Silver:						
Silver nitrate for photography	metric tons	1,726	1,663	1,532	1,365	1,243
Silver nitrate for other uses	do.	335	150	220	295	307
Electrical contacts	do.	313	202	153	219	260
Brazing alloy	do.	139	111	98	95	105
Rolled products	do.	298	193	216	228	248
Other	do.	1,215	636	455	474	434
Total	do.	4,026	2,955	2,674	2,676	2,597

-- Zero.

Source: Arumu Publishing Co. Ltd., Industrial Rare Metals Annual Reviews, Nos. 119, 120, and 121; Ministry of Economy, Trade and Industry, Yearbook of Iron and Steel, Nonferrous Metals, and Fabricated Metals Statistics, 2004, p. 288.

TABLE 7
JAPAN: DOMESTIC ORDERS FOR ORDINARY AND SPECIALTY STEEL PRODUCTS, BY END USE

(Thousand metric tons)

End use	2000	2001	2002	2003	2004
Automobiles:					
Ordinary steel	9,310	9,430	10,310	10,580	10,760
Specialty steel	2,660	2,590	2,990	3,230	3,640
Total	11,970	12,020	13,300	13,810	14,400
Construction:					
Ordinary steel	14,060	13,550	13,580	13,300	13,380
Specialty steel	780	720	640	710	720
Total	14,840	14,270	14,220	14,010	14,100
Conversion and processing:					
Ordinary steel	3,090	2,910	2,790	2,760	2,800
Specialty steel	3,400	3,260	3,560	3,880	4,340
Total	6,490	6,170	6,350	6,640	7,140
Electric machinery and equipment:					
Ordinary steel	2,190	1,940	1,840	1,940	2,030
Specialty steel	140	130	130	160	180
Total	2,330	2,070	1,970	2,100	2,210
Home and office appliances:					
Ordinary steel	610	550	540	580	610
Specialty steel	200	210	200	200	190
Total	810	760	740	780	800
Industrial machinery and equipment:					
Ordinary steel	1,330	1,290	1,360	1,650	1,920
Specialty steel	1,070	940	980	1,180	1,390
Total	2,400	2,230	2,340	3,830	3,310
Shipbuilding and marine equipment:					
Ordinary steel	3,130	3,480	3,420	3,530	4,290
Specialty steel	120	140	180	210	140
Total	3,250	3,620	3,600	3,740	4,430
Steel dealers:					
Ordinary steel	20,030	17,930	17,480	17,070	17,400
Specialty steel	1,280	1,230	1,210	1,350	1,470
Total	21,310	19,160	18,690	18,420	18,870
Tanks and containers:					
Ordinary steel	1,740	1,620	1,560	1,600	1,600
Specialty steel	20	20	20	20	30
Total	1,760	1,640	1,580	1,620	1,630
Other:					
Ordinary steel	610	570	500	410	430
Specialty steel	110	110	110	120	140
Total	720	680	610	530	570
Total domestic demand:					
Ordinary steel	56,100	53,270	53,380	53,420	55,220
Specialty steel	9,780	9,350	10,020	11,060	12,240
Grand total	65,880	62,620	63,400	64,480	67,460

Source: The Steel Industry of Japan 2003-2005, The Japan Iron and Steel Federation.

TABLE 8
JAPAN: EXPORTS OF IRON AND STEEL PRODUCTS, BY PRINCIPAL DESTINATION

(Thousand metric tons)

Destinations	2000	%	2001	%	2002	%	2003	%	2004	%
China	4,062	13.9	4,566	15.0	6,532	18.0	6,435	18.7	6,890	19.5
Korea, Republic of	6,029	20.7	6,537	21.5	9,198	25.3	8,978	26.1	8,950	25.4
Taiwan	2,557	8.8	2,528	8.3	3,263	9.0	3,280	9.5	3,240	9.2
Thailand	2,793	9.6	2,572	8.4	3,350	9.2	3,593	10.4	3,860	10.9
Middle East	1,090	3.7	1,523	5.0	1,074	3.0	1,172	3.4	990	2.8
Europe	854	2.9	1,193	3.9	715	2.0	742	2.2	1,090	3.1
United States	2,137	7.3	2,206	7.2	1,485	4.1	1,076	3.1	1,410	4.0
All other countries	9,639	33.1	9,353	30.7	10,706	29.4	9,135	26.6	8,872	25.1
Grand total	29,161	100.0	30,478	100.0	36,323	100.0	34,411	100.0	35,302	100.0

Source: The Japan Iron and Steel Federation, Monthly Report of the Iron and Steel Statistics and The Steel Industry of Japan 2001-05.

TABLE 9
JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s AND 2000s, AN UPDATE IN 2004

	Australia		Canada	
			British Columbia	
	McArthur River, Northern Territory	Northparkes, New South Wales	Mount Polley[1]	Huckleberry
Nature of project involvement	Investment in exploration and development	Investment in exploration and development	Equity participation	Equity participation and provided loan.
Participating Japanese companies and their equity share	Nippon Mining & Metals Co. Ltd., 16.67%; Mitsui & Co. Ltd., and Marubeni Corp., 4.165% each	Sumitomo Metal Mining Oceania Pty., 13.3%; and SC Mineral Resources Ltd. of Australia, 6.7%	Sumitomo Corp. sold its 47.5% equity interest to Imperial Metals Corp. in 2000.	Mitsubishi Materials Corp., 31.25%; Dowa Mining Co. Ltd., 6.25%; Furukawa Co. Ltd., 6.25%; Marubeni Corp., 6.25%.
Majority equity holder and/or other equity holder	Mount Isa Mines Ltd. of Australia, 75%	North Broken Hill Peko Ltd. of Australia, 80%	Imperial Metals Corp. of Canada, 100%[1]	Princeton Mining Corp. of Canada, 50%.
Mineral commodity involved	Lead, silver, and zinc	Copper and gold	Copper and gold	Copper.
Estimated reserves and ore grade	39.9 million metric tons, 5.5% lead, 12.6% zinc, 55 grams per metric ton silver	63.7 million metric tons, 1.108% copper, 0.487 gram per metric ton gold	81.5 million metric tons, 0.3% copper, 0.42 gram per metric ton gold	56.5 million metric tons, 0.494% copper, 0.014% molybdenum.
Type of mine	Underground	Open pit and underground	Open pit	Open pit.
Total cost of the project	$296 million (Australian)	$303 million (Australian)	$123 million (Canadian)	$136 million (Canadian).
Japanese share	$29 million (Australian)	$75.6 million (Australian)	$109 millon (Canadian)	$78 million (Canadian).
Annual production capacity	1,270,000 metric tons of crude ore containing 6.1% lead, 15.4% zinc	3,934,000 metric tons of crude ore containing 1.73% copper plus 0.88 gram per ton gold	6,500,000 metric tons of crude ore	7,145,600 metric tons of crude ore contining 0.502% copper, 0.013% molybdenum.
Annual shipment to Japan	4,338 metric tons of lead and 23,052 metric tons of zinc in mixed concentrate	22,098 metric tons of copper in concentrate	15,000 metric tons of copper in concentrate plus gold value	28,277 metric tons of copper in concentrate.
Construction started	August 1993	May 1993	September 1996	1996.
Production started or planned	September 1995	October 1995	June 1997	October 1997.

	Chile			
		Region III		
	Collahuasi, Region I	La Candelaria	Atacama Kozan	Los Pelembres, Region IV
Nature of project involvement	Equity participation and provided loan	Investment in exploration and development	Investment in exploration and development	Equity participation.
Participating Japanese companies and their equity share	Mitsui & Co. Ltd., 7.4%; Mitsui Mining & Smelting Co. Ltd., 1.0%; Nippon Mining & Metals Co., Ltd., 3.6%	Sumitomo Metal Mining Co. Ltd., 16% and Sumitomo Corp., 4%	Nittetsu Mining Co. Ltd., 60%	Nippon Mining & Metals Co. Ltd., 15%; Mitsubishi Materials Corp., 10%; Marubeni Corp., 8.75%; Mitsubishi Corp., 5%; Mitsui & Co. Ltd., 1.25%.
Major equity holder and/or other equity holder	Falconbridge Ltd. of Canada, 44%, and Anglo American plc of the United Kingdom, 44%	Phelps Dodge Corp. of the United States, 80%	Inversiones Errazuriz Ltda. of Chile, 40%	Antofagasta plc of the United Kingdom, 60%.
Mineral commodity involved	Copper	Copper and gold	Copper	Copper.
Estimated reserves and ore grade	1,808.2 million metric tons, 0.91% copper	366 million metric tons, 0.84% copper, 0.205 gram per metric ton gold	30 million metric tons, 1.5% copper, 0.26 gram per metric ton gold	2,074 million metric tons, 0.65% copper.
Type of mine	Open pit	Open pit	Underground	Open pit.
Total cost of the project	$1,760 million	$592 million	$111 million	$1,360 million.
Japanese share	$375 million	$296 million	$101 million	$614 million.
Annual production capacity	25,600,000 metric tons of crude ore	10,000,000 metric tons of crude ore	1,650,000 metric tons of crude ore	34,000,000 metric tons of crude ore.
Annual shipment to Japan	96,023 metric tons of copper in concentrate	85,313 metric tons of copper in concentrate	13,000 metric tons of copper in concentrate	163,200 metric tons of copper in concentrate.
Construction started	1996	April 1993	May 1999	November 1997.
Production started or planned	January 1999	March 1995	June 2003	April 2000.

See footnotes at end of table.

TABLE 9--Continued

JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECT OF NONFERROUS METALS MINES IN THE 1990s AND 2000s, AN UPDATE IN 2004

	Indonesia, Batu Hijau, Sumbawa Island	Mexico		Peru
		Tizapa, Mexico City	Rey de Plata, Guerrero	Antamina, Ancash
Nature of project involvement	Equity participation	Investment in exploration and development	Investment in exploration and development	Investment in exploration and development.
Participating Japanese companies and their equity share	Sumitomo Corp., 26%; Sumitomo Metal Mining Co. Ltd., 5.0%; Mitsubishi Materials Corp., 2.5%; Furukawa Co. Ltd., 1.5%	Dowa Mining Co. Ltd., 39%, and Sumitomo Corp., 10%	Dowa Mining Co. Ltd., 39%, and Sumitomo Corp., 10%	Mitsubishi Corp., 10%.
Majority equity holder and/or other equity holder	Newmont Gold Co. of the United States, 45%, and P.T. Pukuafu Indah of Indonesia, 20%	Industrias Penoles SA de C.V. of Mexico, 51%	Industrias Penoles SA de C.V. of Mexico, 51%	Noranda Inc. of Canada and Billiton plc of the United Kingdom, 33.75% each; Teck Cominoco Ltd. of Canada, 22.5%.
Mineral commodity involved	Copper and gold	Copper, lead, and zinc	Copper, lead, and zinc	Copper and zinc.
Estimated reserves and ore grade	907.3 million metric tons, 0.44% copper, 0.377 gram per metric ton gold	2.5 million metric tons, 0.61% copper, 1.36% lead, 6.56% zinc plus gold and silver	2.9 million metric tons, 0.68% copper, 2.56% lead, 8.78% zinc plus gold and silver	559 million metric tons, 1.23% copper, 1.03% zinc, and 0.03% molybdenum.
Type of mine	Open pit	Underground	Underground	Open pit.
Total cost of the project	$1,925 million	$38.2 million	$45.4 million	$2,296 million.
Japanese share	$513 million	$35.1 million	$41.3 million	$404 million.
Annual production capacity	43,870,000 metric tons of crude ore containing 0.75% copper and 0.44 gram per metric ton gold	480,000 metric tons of crude ore	330,000 metric tons of crude ore	25,600,000 metric tons of crude ore.
Annual shipment to Japan	92,128 metric tons of copper in concentrate	23,500 metric tons of zinc in concentrate	21,985 metric tons of zinc in concentrate	10,579 metric tons of copper in concentrate.
Construction started	September 1996	May 1992	January 1998	1998.
Production started or planned	October 1999	November 1994	October 2000	June 2001.

	Peru		The Philippines	United States
	Cerro Verde, Arequipa	Pallca, Ancash	Padcal, Luzon	Pogo, Alaska
Nature of project involvement	Equity participation (planned)	Equity participation	Long-term loan	Mine owned by Sumitomo Metal Mining Co. Ltd.
Participating Japanese companies and their equity share	Sumitomo Metal Mining Co. Ltd., 21% (planned)	Mitsui & Co. Ltd., 30%	Pan Pacific Copper Co. Ltd.,	Teck Cominco Co., 40%, and SC America Minerals, Inc., 9%.
Major equity holder and/or other equity holder	Phelp Dodge Corp., 53.6%; Compania de Minas Buenaventura S.A.A., 18.2%; others, 7.2%	Mitsui Mining & Smelting Co. Ltd., 70%	Philex Mining Corp.	Sumitomo Metal Mining America Inc., 51%.
Mineral commodity invloved	Copper	Lead and zinc	Copper and gold	Gold.
Estimated reserves and ore grade	1,033 million metric tons, 0.514% copper, 0.01% molybdenum	6 million metric tons, 1% lead, 12% zinc	34.9 million metric tons, 0.28% copper, 0.78gram gold per metric ton	152 metric tons.
Type of mine	Open pit	Underground	Underground	Underground.
Total cost of the project	$850 million	$6.2 million	$15 million	$280 million.
Japanese share	About $265 million		$15 million	$168 million.
Annual production capcity	180,000 metric tons of copper in concentrate	170,000 metric tons of crude ore	70,000 metric tons of copper concentrate	12 metric tons of gold.
Annual shipment to Japan	Aproximately 90,000 metric tons of copper in concentrate	Unknown	15,000 metric tons of copper and 2 metric tons of gold in copper concentrate	Unknown
Construction started	Unknown	2005	December 2003	June 2004.
Production started or planned	The fourth quarter of 2006	November 2006	2006	March 2006.

[1] SC Minerals Canada Ltd. (a wholly owned subsidiary of Sumitomo Corp.) sold its 47.5% interest in Mount Polley Copper Project to Imperial Metals Corp. of Canada for $4.5 million by the end of 2000.

Sources: Research Institute of Economy, Trade and Industry (Chosakai), Mining Handbook (Kogyo Benran), 2002, p. 210-217; Japan Oil, Gas and Metals National Corp., Metal Mining Data Book, 2004, p. 190-193.

TABLE 10
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2003	2004	Destinations, 2004	
			United States	Other, principal
METALS				
Alkali and alkaline-earth metals	285	196	17	China 25; Other Asia, nes 23; France 20.
Aluminum:				
Ore and concentrate	643	915	--	Republic of Korea 500; Other Asia, nes 400.
Oxides and hydroxides	290,948	285,508	3	Republic of Korea 127,642; China 53,542; Other Asia, nes 40,924.
Ash and residue containing aluminum	15,265	27,540	--	China 23,809; North Korea 2,614; Indonesia 540.
Metal, including alloys:				
Scrap	69,238	79,001	83	China 72,569; Hong Kong 3,118; Republic of Korea 1,592.
Unwrought	18,198	36,303	1,770	Thailand 17,695; Republic of Korea 5,972; China 3,343.
Semimanufactures, all forms	329,430	309,469	16,425	China 90,421; Thailand 42,644; Other Asia, nes 37,837.
Antimony:				
Ore and concentrate	2,979	904	--	All to China.
Oxides	2,320	2,578	115	China 497; Malaysia 346; Other Asia, nes 311.
Metal, including alloys, all forms[2]	888	464	1	Other Asia, nes 419; Malaysia 23; Thailand 13.
Arsenic, metal, including alloys, all forms	5	5	4	Mainly to United Kingdom.
Beryllium, metal, including alloys, all forms	89	8	1	Mainly to China.
Bismuth, metal, including alloys, all forms[2]	15	39	(3)	Hungary 13; United Kingdom 7; China 5.
Cadmium, metal, including alloys, all forms	1,215	1,411	138	China 1,168; Israel 104.
Chromium:				
Ore and concentrate	27,270	191	--	Other Asia, nes 159; Republic of Korea 29; Indonesia 3.
Oxides and hydroxides	5,143	6,032	1,181	Republic of Korea 2,579; Other Asia, nes 1,407; Thailand 169.
Metal, including alloys, all forms	644	907	428	Other Asia, nes 148; Republic of Korea 108; China 90.
Cobalt:				
Ore and concentrate	2	--	--	All to India.
Oxides and hydroxides	1,036	1,206	4	China 566; Republic of Korea 294; Other Asia, nes 138.
Metal, including alloys, all forms	2,396	2,095	215	China 683; Canada 565; Other Asia, nes 220.
Columbium and tantalum, tantalum metal, including alloys, all forms	423	445	100	Germany 138; Thailand 31; Israel 28.
Copper:				
Ore and concentrate	(3) r	(3)	--	
Matte, including cement copper	3,008	--	--	
Oxides and hydroxides	1,993	1,988	12	China 493; Malaysia 456; Republic of Korea 365.
Sulfate	3,833	4,325	16	Other Asia, nes 2,662; Hong Kong 614; Republic of Korea 515.
Metal, including alloys:				
Scrap	307,055	329,909	133	China 318,682; Hong Kong 5,810; Other Asia, nes 1,410.
Unwrought	331,241	227,785	6,485	Other Asia, nes 78,376; China 72,322; Republic of Korea 28,436.
Semimanufactures, all forms	286,647	308,680	17,801	China 57,158; Malaysia 43,284; Other Asia, nes 35,926.
Germanium, metal, including alloys, all forms	5	6	--	Mainly to China.
Gold, metal, including alloys, unwrought and partly wrought	101	90	(3)	Malaysia 23; Singapore 22; Other Asia, nes 18.
Iron and steel:				
Iron ore and concentrate	44,352 r	591	--	China 562; Republic of Korea 23; Other Asia, nes 6.
Metal:				
Scrap thousand metric tons	5,720	6,809	(3)	China 2,789; Republic of Korea 2,657; Other Asia, nes 930.
Pig iron, cast iron, related materials do.	158	86	2	Republic of Korea 46; Thailand 15; Other Asia, nes 5.
Ferroalloys:				
Ferrochromium	2,239	2,597	2,058	Thailand 338; India 120; Republic of Korea 30.
Ferromanganese	17,433	9,870	1,200	Other Asia, nes 4,193; Republic of Korea 1,307; Thailand 1,001.
Ferromolybdenum	27	43	(3)	Thailand 21; Malaysia 6; Singapore 6.
Ferronickel	101,598	111,024	--	Republic of Korea 60,583; Other Asia, nes 48,231; China 2,203.
Ferrosilicochromium	5	1,097	--	Republic of Korea 1,092; Hong Kong 3; China 2.
Ferrosilicomanganese	371	168	--	Other Asia, nes 142; Indonesia 26.
Ferrosilicon	6,994	7,391	14	Republic of Korea 2,499; Indonesia 1,924; Other Asia, nes 1,100.
Ferrotungsten	--	2	--	All to Thailand.
Silicon metal	515	902	34	China 336; Republic of Korea 279; Other Asia, nes 164.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

				Destinations, 2004	
Commodity		2003	2004	United States	Other, principal
METALS--Continued					
Lead:					
Ore and concentrate		7	3	--	Mainly to China.
Oxides		757	618	10	Germany 218; Republic of Korea 200; Netherlands 96.
Metal, including alloys:					
Scrap		12,155	19,635	--	Republic of Korea 13,354; China 5,219; Malaysia 927.
Unwrought		17,178	19,401	--	China 13,618; Indonesia 1,978; Other Asia, nes 1,393.
Semimanufactures		876	1,140	6	Other Asia, nes 580; China 276; Republic of Korea 143.
Lithium:					
Oxide and hydroxide		12	17	(3)	China 10; Republic of Korea 3; United Kingdom 3.
Magnesium, metal, including alloys:					
Scrap		193	23	--	China 13; United Kingdom 6; Other Asia, nes 3.
Unwrought	ilue, thousands	$393 [r]	$657	$6	Other Asia, nes $524; Philippines $47; Hong Kong $34.
Semimanufactures		3,115	2,098	3	Other Asia, nes 1,262; China 801.
Manganese:					
Ore and concentrate		20	42,244	--	All to China.
Oxides		24,745	29,229	2,431	Indonesia 8.087; Singapore 5,484; China 3,713.
Metal, including alloys, all forms		311	261	(3)	Viet Nam 179; Thailand 26; Other Asia, nes 20.
Mercury		126	54	--	Netherlands 35; India 17; Viet Nam 1.
Molybdenum:					
Ore and concentrate:					
Roasted		27	2	--	All to Italy.
Unroasted	ilue, thousands	$310	$10	--	All to Singapore.
Oxides and hydroxides		18	132	3	Other Asia, nes 117; China 6; Indonesia 2.
Metal, including alloys, all forms		269	426	32	Other Asia, nes 173; Republic of Korea 114; Austria 18.
Nickel:					
Ore and concentrate	value, thousands	$73	$72	--	All to the Philippines.
Matte and speiss		27,916	32,682	(3)	Republic of Korea 16,791; Other Asia, nes 15,157; Netherlands 700.
Oxides and hydroxides		5,217	6,731	830	China 3,493; Other Asia, nes 756; Hong Kong 606.
Metal, including alloys:					
Scrap		648	400	177	United Kingdom 126; Other Asia, nes 60; Canada 12.
Unwrought		916	1,433	30	Hong Kong 848; Other Asia, nes 108; Indonesia 112.
Semimanufactures		11,766	15,915	393	Iran 3,077; China 1,970; Hong Kong 1,895.
Platinum-group metals:					
Metal, including alloys, unwrought and partly wrought:					
Palladium	value, thousands	$40	$52	$13	Austria $17; Republic of Korea $7; China $6.
Platinum	do.	$147	$144	$4	Hong Kong $96; Thailand $10.
Rhodium	do.	$3	$3	(3)	Mainly to Hong Kong.
Iridium, osmium, ruthenium	do.	$3	$2	(3)	Mainly to Germany.
Rare-earth, metal, including alloys, all forms		175	277	4	China 252; Hong Kong 20.
Selenium		570	539	4	China 272; Hong Kong 90; India 71.
Silicon		5,012	6,175	482	United Kingdom 1,665; China 955; Republic of Korea 955.
Silver, metal, including alloys, unwrought and partly wrought	value, thousands	$118	$181	$15	Other Asia, nes $52; Hong Kong $27; China $24.
Tin:					
Metal, including alloys:					
Scrap		681	600	--	Belgium 315; United Arab Emirates 247; Republic of Korea 23.
Unwrought		397	973	(3)	Philippines 234; Malaysia 197; China 126.
Semimanufactures		2,367	2,944	113	China 705; Other Asia, nes 345; Malaysia 156.
Titanium:					
Ore and concentrate		39	84	--	Other Asia, nes 79; Viet Nam 4.
Oxides		28,637	31,058	1,522	China 12,846; Other Asia, nes 8,359; Republic of Korea 2,669.
Metal, including alloys, all forms		17,965	10,680	821	Republic of Korea 1,368; China 1,366; Sweden 1,332.

See footnotes at end of table

TABLE 10--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2003	2004	Destinations, 2004	
				United States	Other, principal
METALS--Continued					
Tungsten:					
Ore and concentrate		--	533	--	Mainly to China.
Metal, including alloys, all forms		1,757	2,287	325	Other Asia, nes 428; China 417; Thailand 86.
Uranium and thorium, metal, including alloys, all forms		7	1	1	
Vanadium:					
Oxides and hydroxides		248	221	1	Republic of Korea 176; Other Asia, nes 21; China 9.
Metal, including alloys, all forms		54	32	--	Mainly to Other Asia, nes.
Zinc:					
Ore and concentrate		119	3,013	--	Republic of Korea 2,983; Hong Kong 30.
Oxides		2,051	2,416	149	Thailand 456; Turkey 440; Other Asia, nes 197.
Blue powder		3	10	--	Republic of Korea 6; Singapore 4.
Ash and residue containing zinc		1,275	2,379	--	China 1,166; Republic of Korea 924; Other Asia, nes 242.
Metal, including alloys:					
Scrap		4,194	3,617	--	China 2,841; Other Asia, nes 534; Hong Kong 214.
Unwrought		77,661	76,188	2	Other Asia, nes 22,066; Indonesia 17,249; Philippines 10,745.
Semimanufactures		3,347 r	3,343	20	China 1,115; Singapore 298; India 188.
Zirconium:					
Ore and concentrate		585	1,143	1	China 790; Malaysia 177; Philippines 139.
Metal, including alloys, all forms		26	50	1	Canada 35; Republic of Korea 4; Other Asia, nes 3.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural, corundum, emery, pumice, etc.		22,423	28,873	15	Republic of Korea 12,895; China 9,858; Other Asia, nes 2,289.
Artificial:					
Corundum		22,944	22,202	1,958	Other Asia, nes 4,077; China 3,207; Thailand 1,834.
Silicon carbide		9,562	9,123	1,250	Republic of Korea 3,398; Other Asia, nes 1,759; Thailand 767.
Dust and powder of precious and semiprecious stones, including diamond	value, thousands	$180	$251	$182	Hong Kong $41; Republic of Korea $13; China $10.
Grinding and polishing wheels and stones		8,700	10,381	1,281	Indonesia 2,042; Republic of Korea 1,266; Thailand 853.
Asbestos, crude	value, thousands	$25 r	$4	--	All to Hong Kong.
Barite and witherite	do.	$42 r	$27	--	Viet Nam $18; France $7; Indonesia $2.
Boron materials:					
Crude natural borates	do.	$24 r	$61	--	Singapore $35; China $26.
Oxides and acids		461	343	24	Other Asia, nes 116; Republic of Korea 76; Malaysia 60.
		9,734	10,313	2	China 2,114; Hong Kong 2,113; Singapore 1,420.
Chalk		2,221	1,921	--	Republic of Korea 1,196; Indonesia 306; Other Asia, nes 285.
Clays, crude:					
Bentonite		2,291	2,814	6	Thailand 1,265; Indonesia 873; Singapore 294.
Chamotte or dinas earth		45	54	--	All to Republic of Korea.
Fire clay		3,440	3,175	--	Other Asia, nes 846; Republic of Korea 599; Thailand 421.
Fuller's earth		--	2	--	All to Singapore.
Kaolin		8,397	4,731	64	China 1,706; Other Asia, nes 1,344; Hong Kong 465.
Unspecified		19,220 r	22,290	25	Indonesia 5,626; China 4,772; Malaysia 2,455.
Diamond, natural:					
Gem, not set or strung	value, thousands	$13,061	$27,810	$3,428	Hong Kong $14,572; Italy $5,252.
Industrial stones	do.	$1,887	$2,908	$200	Thailand $1,239; Belgium $31; China $24.
Dust and powder	do.	$7,816	$7,970	$4,839	Republic of Korea $916; Philippines $610; China $594.
Diatomite and other infusorial earth		2,140	3,673	825	Viet Nam 729; Other Asia, nes 717; Republic of Korea 422.
Feldspar		4,034	2,466	--	Other Asia, nes 1,443; Thailand 638; Hong Kong 217.
Fluorspar	value, thousands	$404	$457	--	Germany $157; Singapore $139; Thailand $72.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

				Destinations, 2004	
Commodity		2003	2004	United States	Other, principal
INDUSTRIAL MINERALS--Continued					
Fertilizer materials:					
Crude, n.e.s.		6,823	10,653	1	China 7,575; Republic of Korea 1,008; Malaysia 595.
Manufactured:					
Ammonia		4,962	6,669	1,061	Other Asia, nes 2,520; Singapore 1,219; China 757.
Nitrogenous		887,465	869,615	1,289	Malaysia 340,710; Philippines 260,796; Viet Nam 234,308.
Phosphatic		3,345	400	50	Republic of Korea 126; Other Asia, nes 96; China 79.
Potassic		209	444	220	China 102; Republic of Korea 64; Other Asia, nes 33.
Graphite, natural		1,427	1,579	262	Republic of Korea 405; Other Asia, nes 169; China 131.
Gypsum and plaster		4,569	4,267	46	Bangladesh 1,121; Republic of Korea 1,058; Other Asia, nes 540.
Iodine		5,229	5,211	1,559	France 611; United Kingdom 558; Italy 536.
Kyanite and related materials, mullite and unspecified		2,480	3,870	18	Republic of Korea 2,921; Sri Lanka 700; Other Asia, nes 320.
Lime		4,485	4,378	230	Other Asia, nes 1,539; Singapore 825; Republic of Korea 562.
Magnesium compounds:					
Magnesite, crude		49	90	--	Republic of Korea 35; Other Asia, nes 30; Indonesia 16.
Oxides and hydroxides		50,930	48,499	5,454	Republic of Korea 17,755; Other Asia, nes 8,362; China 4,622.
Mica:					
Crude including splittings and waste		1,137	1,377	311	Thailand 461; China 144; Republic of Korea 142.
Worked including agglomerated splittings		1,676	1,883	12	China 868; Austria 599; Other Asia, nes 102.
Nitrates, crude		794	1,628	--	Indonesia 1,506; Thailand 101; Philippines 16.
Phosphates, crude		25	9	--	Viet Nam 7; Denmark 2.
Phosphorus, elemental		31	31	1	Republic of Korea 25; China 1; Russia 1.
Pigments, mineral, iron oxides and hydroxides processed		50,709	43,306	5,606	China 20,682; Thailand 4,506; Other Asia, nes 1,273.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$5,971	$8,589	$735	Other Asia, nes $4,385; Hong Kong $1,792; Thailand $735.
Synthetic	do.	$40,644	$51,925	$8,280	China $8,568; Hong Kong $6,631; Thailand $3,696.
Pyrite, unroasted		42	18	--	New Zealand 13; Republic of Korea 5.
Quartz crystal, piezoelectric	value, thousands	$38,136	$41,682	$4,092	Singapore $11,788; Hong Kong $5,647; Malaysia $5,476.
Salt and brine		1,148	1,562	62	China 413; Republic of Korea 182; Singapore 166.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		32,833	37,259	11	China 37,199; Republic of Korea 46.
Worked	value, thousands	$1,749	$2,144	$789	China $495; Republic of Korea $266; Other Asia, nes $248.
Dolomite, chiefly refractory-grade		198	799	27	Other Asia, nes 760; Malaysia 9; United Kingdom 3.
Gravel and crushed rock		5,120	6,301	2	Republic of Korea 4,006; Other Asia, nes 1,131.
Limestone other than dimension	thousand metric tons	2,508	2,994	--	Other Asia, nes 1,869; Australia 574; Republic of Korea 545.
Quartz and quartzite		2,218	4,237	66	Singapore 1,460; Republic of Korea 1,360; France 647.
Sand other than metal-bearing and sand and gravel		13,296	18,804	208	Republic of Korea 8,486; Other Asia, nes 3,467; China 2,307.
Sulfur:					
Elemental:					
Crude including native and byproduct	thousand metric tons	1,179	1,160	--	China 793; Republic of Korea 140; Indonesia 119.
Colloidal, precipitated, sublimed		1,065	1,993	968	Mexico 280; Indonesia 234; Republic of Korea 129.
Dioxide		7	2	(3)	Mainly to Other Asia, nes.
Sulfuric acid	thousand metric tons	1,240	1,158	1	China 626; Other Asia, nes 220; Chile 109.
Talc, steatite, soapstone, pyrophyllite		7,786	10,229	363	China 1,727; Hong Kong 1,686; Singapore 1,418.
Vermiculite, perlite, chlorite		23,386	20,194	71	Other Asia, nes 2,477; Republic of Korea 16,105; China 1,452.
Other: Slag and dross, not metal-bearing	thousand metric tons	5,766	7,704	329	Other Asia, nes 2,634; Republic of Korea 1,400; United Arab Emirates 840.

[r] Revised. -- Zero.

[1] Data presented in this table are from United Nations, Department of Economic and Social Affairs, Statistics Division.

[2] Includes waste and scrap.

[3] Less than 1/2 unit.

TABLE 11
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

				Sources, 2004	
Commodity		2003	2004	United States	Other, principal
METALS					
Alkali and alkaline-earth metals		603	648	125	France 452; China 290; Russia 16.
Aluminum:					
Ore and concentrate		2,010,520	1,945,759	--	Australia 1,040,397; Indonesia 690,605; India 158,961.
Oxides and hydroxides		80,621	120,981	7,381	Australia 85,625; China 11,253; Republic of Korea 9,588.
Ash and residue		2,359	8,710	--	Republic of Korea 4,724; Thailand 3,058; China 788.
Metal, including alloys:					
Scrap		113,495	105,681	28,748	Arabia 11,486; United Kingdom 10,784; Australia 7,194.
Unwrought	thousand metric tons	2,941	3,021	7	Russia 772; Australia 554; China 324.
Semimanufactures		63,036	90,777	11,677	Bahrain 54,638; Republic of Korea 31,664; Germany 7,802.
Antimony:					
Ore and concentrate		--	10	--	All from China.
Oxides		7,324	7,977	43	China 7,077; Mexico 478; Other Asia, nes 308.
Metal, including alloys, all forms		7,274	8,176	--	Mainly from Other Asia, nes.
Arsenic, metal, including alloys, all forms		42	20	--	Mainly from China.
Beryllium, metal, including alloys, all forms		2	7	1	Mainly from Thailand.
Bismuth		780	935	13	China 565; Peru 227; Belgium 67.
Cadmium, metal, including alloys, all forms		3,917	2,668	(2)	Republic of Korea 940; Canada 504; Peru 374.
Chromium:					
Ore and concentrate		184,662	271,284	100	India 161,484; South Africa 68,689; Philippines 13,055.
Oxides and hydroxides		4,843	4,196	141	China 2,249; Kazakhstan 960; United Kingdom 438.
Metal, including alloys, all forms		3,917 [r]	2,668	--	Republic of Korea 940; Canada 504; Peru 374.
Cobalt:					
Ore and concentrate		11	10	--	All from China.
Oxides and hydroxides		3,510	2,626	93	Belgium 1,611; Finland 574; Other Asia, nes 152.
Metal, including alloys, all forms		12,688	15,181	330	Finland 3,931; Australia 3,360; Canada 2,309.
Columbium and tantalum, tantalum metal, including alloys, all forms		301	263	80	Thailand 93; China 28; Germany 17.
Copper:					
Ore and concentrate	thousand metric tons	4,106	4,457	10	Chile 2,255; Indonesia 619; Australia 421.
Matte including cement copper		1,988	15,046	--	Chile 11,514; Australia 1,613; Viet Nam 822.
Oxides and hydroxides		2,469	2,618	1,622	Malaysia 260; Australia 210; Viet Nam 216.
Sulfate		1,185	1,798	22	China 1,256; Thailand 200; Republic of Korea 180.
Ash and residue containing copper		2,726	6,772	4,894	Malaysia 1,416; Indonesia 405; Philippines 57.
Metal, including alloys:					
Scrap		121,498	145,102	27,083	Philippines 22,096; Singapore 17,570; Malaysia 17,307.
Unwrought		85,401	97,677	1,164	Chile 54,588; Peru 11,629; Republic of Korea 10,318.
Semimanufactures		64,735	82,724	2,715	Republic of Korea 21,631; China 16,563; Malaysia 14,514.
Germanium, metal, including alloys, all forms		11	9	(2)	China 7; Belgium 2.
Gold, metal, including alloys, unwrought and partly wrought		49 [r]	80	9	Switzerland 34; Australia 11; Hong Kong 9.
Iron and steel:					
Iron ores and concentrates	thousand metric tons	132,082	134,884	(2)	Australia 85,441; Brazil 23,953; India 12,139.
Metal:					
Scrap	do.	240 [r]	261	46	Republic of Korea 83; Other Asia, nes 64; Thailand 12.
Pig iron, cast iron, related materials		642,860 [r]	693,736	8,008	China 358,092; Brazil 109,131; India 51,764.
Ferroalloys:					
Ferrochromium		913,593	977,219	(2)	South Africa 524,903; Kazakhstan 232,682; Zimbabwe 70,023.
Ferromanganese		87,308	51,204	--	Australia 18,098; China 15,823; South Africa 9,745.
Ferromolybdenum		5,121	5,066	--	China 4,682; Chile 308; Republic of Korea 36.
Ferronickel		56,947	55,602	--	New Caldonia 36,757; Colombia 8,425; Dominican Republic 7,558.
Ferrosilicochromium		1,220	4,230	--	All from China.
Ferrosilicomanganese		283,113	300,452	--	China 196,065; Ukraine 33,041; India 25,492.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

				Sources, 2004	
Commodity		2003	2004	United States	Other, principal
METALS--Continued					
Iron and steel--Continued					
Metal--Continued					
Ferroalloys--Continued					
Ferrosilicon		510,398	562,840	2	China 401,217; Russia 6; Brazil 64.
Ferrotungsten		1,307	1,329	--	All from China.
Silicon metal		215,269	242,442	32	China 201,796; Norway 17,312; Australia 7,412.
Lead:					
Ore and concentrate		184,485	140,716	73,408	Australia 37,739; Bolivia 12,444; Russia 11,750.
Oxides		24,836	21,802	27	China 10,280; Other Asia, nes 6,373; Mexico 2,700.
Metal, including alloys:					
Unwrought		15,160	14,811	9	China 12,543; Peru 1,237; Mexico 904.
Semimanufactures		2,238	2,106	2	China 1,040; France 877; Germany 128.
Lithium, oxides and hydroxides		1,457	1,497	1,211	China 194; Russia 89; Other Asia, nes 2.
Magnesium, metal, including alloys:					
Scrap		1,921	1,620	--	Other Asia, nes 999; China 600; Malaysia 20.
Unwrought		40,434	42,130	35	China 39,459; Canada 1,611; Norway 892.
Semimanufactures		7,075	10,272	205	China 1,088; Russia 514.
Manganese:					
Ore and concentrate		1,192	1,259	--	South Africa 764; Australia 390; Ghana 54.
Oxides and dioxides		3,911	10,441	4	China 5,813; South Africa 2,935; Belgium 986.
Metal, including alloys, all forms		64,184	83,338	795	China 73,700; South Africa 8,617; United Kingdom 170.
Mercury		5	3	(2)	Mainly from Spain.
Molybdenum:					
Ore and concentrate:					
Roasted		32,727	19,774	2,058	Chile 19,774; Mexico 4,951; Canada 3,413.
Unroasted		39	110	73	Mainly from Mongolia.
Oxides and hydroxides		809	2,473	713	Chile 788; China 425; Uzbekistan 324.
Metal, including alloys, all forms		865	1,010	192	Austria 361; China 306; Other Asia, nes 97.
Nickel:					
Ore and concentrate	thousand metric tons	4,208	4,513	--	Indonesia 2,331; Philippines 1,100; New Caldonia 1,081.
Matte		121,240	128,599	--	Indonesia 94,358; Australia 34,134; Cuba 84.
Oxides and hydroxides		163	258	16	Canada 187; Finland 36; Germany 20.
Metal, including alloys:					
Scrap		10,664	9,434	1,996	Netherlands 1,914; Russia 1,426; Republic of Korea 1,341.
Unwrought		54,527	52,562	34	Russia 10,099; South Africa 7,369; China 6,729.
Semimanufactures		9,769	12,782	1,214	Canada 4,910; United Kingdom 4,815; Germany 817.
Platinum-group metals:					
Metal, including alloys, unwrought and partly wrought:					
Palladium	value, thousands	$392	$482	$58	Russia $146; United Kingdom $64; Switzerland $40.
Platinum	do.	$1,111	$1,712	$74	South Africa $1,232; Russia $176; United Kingdom $74.
Rhodium	do.	$125	$224	$10	South Africa $147; Russia $33; United Kingdom $18.
Iridium, osmium, ruthenium	do.	$18	$31	$2	South Africa $26; Russia $1; United Kingdom $1.
Rare-earth metals, including alloys, all forms		6,119	6,379	(2)	China 6,376; Other Asia, nes 2.
Selenium		15	13	(2)	Belgium 6; Philippines 6.
Silicon, high-purity		8,085	10,981	6,334	United Kingdom 1,679; Germany 1,341; China 997.
Silver:					
Ore and concentrate		11,470	13,202	--	Chile 10,824; Peru 2,378.
Metal including alloys, unwrought and partly wrought:		1,929	2,664	772	Republic of Korea 469; Peru 415; Mexico 413.
Tin, metal, including alloys:					
Scrap		78	128	--	Republic of Korea 64; Thailand 43; China 17.
Unwrought		30,483	33,078	32	China 12,731; Indonesia 12,227; Malaysia 4,163.
Semimanufactures		862	1,386	1	Thailand 1,193; China 278; Malaysia 85.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2003	2004	Sources, 2004	
				United States	Other, principal
METALS--Continued					
Titanium:					
Ore and concentrate		457,124	450,287	--	Viet Nam 152,394; Australia 135,766; India 60,062.
Oxides		11,560	15,211	183	China 8,620; Republic of Korea 3,567; France 1,632.
Metal, including alloys, all forms		979	784	358	Russia 252; United Kingdom 87; Italy 20.
Tungsten:					
Ore and concentrate		758	134	--	Mainly from the Russia.
Metal, including alloys, all forms		1,145	1,474	120	China 977; Republic of Korea 108; Austria 88.
Uranium and thorium:					
Ore and concentrate		22	33	--	Malaysia 20; India 13.
Metal, including alloys, all forms		1,345	302	1	Mainly from Canada.
Vanadium, metal, including alloys, all forms					
Oxides and hydroxides		3,810	2,274	(2)	South Africa 1,200; China 1,074.
Metal including alloys, all forms		175	316	236	Germany 79; Russia 1.
Zinc:					
Ore and concentrate	thousand metric tons	1,060	1,125	188	Australia 404; Bolivia 149; Peru 182.
Oxides		18,924	19,097	503	China 9,492; Republic of Korea 5,617; India 1,520.
Blue powder		2,280	2,231	--	China 1,162; Republic of Korea 526; Singapore 282.
Ash and residue containing zinc		23,576 ^{r}	34,159	3,833	Republic of Korea 8,944; Iran 1,855; Philippines 1,037.
Metal including alloys:					
Scrap		72	97	16	Thailand 42; Republic of Korea 25; Philippines 14.
Unwrought		42,607	44,386	28	China 18,797; Peru 14,370; Namibia 4,101.
Semimanufactures		3,691 ^{r}	2,294	18	China 1,993; Republic of Korea 137; Switzerland 62.
Zirconium:					
Ore and concentrate		55,114	67,915	1,088	Australia 39,926; South Africa 21,219; Russia 3,975.
Metal including alloys, all forms		567	553	251	France 296; Sweden 4; United Kingdom 1.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural, corundum, emery, pumice, etc.		17,515	14,937	1,585	India 6,866; China 4,609; Turkey 1,141.
Artificial:					
Corundum		166,370	172,958	353	China 140,271; Austria 9,208; Australia 6,508.
Silicon carbide		78,253	86,141	23	China 82,376; Brazil 1,294; Norway 960.
Dust and powder of precious and semiprecious stones, including diamond	value, thousands	$1,701 ^{r}	$3,499	$3,137	China $284; Brazil $32; Belgium $21.
Grinding and polishing wheels and stones		6,939	7,971	189	China 4,339; Thailand 2,571; Republic of Korea 237.
Asbestos, crude	value, thousands	$9,550 ^{r}	$3,663	--	Canada $2,308; Brazil $753; Zimbabwe $462.
Barite and witherite		71,302	51,276	491	China 47,624; North Korea 2,828; Thailand 303.
Boron:					
Crude natural borates		31,792	40,994	84	Turkey 32,050; Russia 8,843; Chile 17.
Oxides and acids		41,561	50,568	20,578	Russia 23,006; Turkey 3,660; Chile 2,315.
Cement		858,666	841,114	1,396	Republic of Korea 794,161; China 31,051; France 12,569.
Chalk		10	1	--	All from Germany.
Clays, crude:					
Bentonite		197,203	215,815	174,162	China 39,759; New Zealand 948.
Chamotte or dinas earth		10,011	12,234	--	China 7,362; Republic of Korea 2,378; South Africa 2,351.
Fire clay		6,571	6,056	2,020	China 4,005; Russia 30; Belgium 1.
Fuller's earth		9,782	11,063	3,817	China 6,932; Australia 314.
Kaolin	thousand metric tons	1,277	1,275	793	Brazil 314; China 68.
Unspecified		144,394 ^{r}	158,729	1,748	China 155,348; India 741; Germany 277.
Diamond, natural:					
Gem, not set or strung	value, thousands	$992,927	$1,154,675	$41,345	India $499,831; Belgium $263,107; Israel $179,701.
Industrial stones	do.	$9,595	$10,086	$2,282	Botswana $3,275; Belgium $1,726; United Kingdom $1,382.
Dust and powder	do.	$45,671	$52,286	$7,788	Ireland $25,495; China $8,231; Switzerland $5,019.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2003	2004	Sources, 2004	
				United States	Other, principal
INDUSTRIAL MINERALS--Continued					
Diatomite and other infusorial earth		7,279	6,714	4,930	China 1,687; Netherlands 34; Germany 20.
Feldspar		7,912	18,312	--	Republic of Korea 16,197; Malaysia 759; China 607.
Fluorspar		239,021	444,043	--	China 294,806; Mexico 135,733; Mongolia 3,385.
Fertilizer materials					
Crude, n.e.s.		29,759	32,756	6	China 16,005; Indonesia 12,093; Philippines 1,473.
Manufactured:					
Ammonia		270,252	234,459	(2)	Indonesia 208,533; Republic of Korea 17,763; Bangladesh 7,984.
Phosphatic		165,768	171,958	42,930	China 112,967; Republic of Korea 10,624; Israel 5,400.
Potassic		864,843	961,052	193,309	Canada 418,307; Russia 107,645; Germany 57,044.
Graphite, natural		121,559	178,112	312	China 171,762; North Korea 2,768; Sri Lanka 1,860.
Gypsum and plaster	thousand metric tons	2,139 r	1,994	(2)	Australia 1,003; Thailand 982; China 4.
Iodine		1,021	509	27	Chile 468; Indonesia 14.
Lime		1,565	4,723	996	China 3,592; Republic of Korea 77; Malaysia 45.
Kyanite and related materials, mullite and unspecified		10,875	27,767	3,218	South Africa 12,893; China 8,802; Hungary 1,069.
Magnesium compounds:					
Magnesite, crude		790	7,107	--	China 6,747; Australia 360.
Oxides and hydroxides		569,112	611,479	459	China 585,656; Republic of Korea 13,238; North Korea 5,821.
Other		427	3,289	--	Germany 2,400; China 1.
Mica:					
Crude including splittings and waste		53,473	61,277	416	China 44,941; India 6,644; Canada 4,148.
Worked including agglomerated splittings		173	153	17	Belgium 30; China 27; United Kingdom 24.
Nitrates, crude		21,801	17,557	--	Chile 17,507; China 40; Germany 10.
Phosphates, crude		814,521	820,572	11,563	China 399,420; South Africa 174,731; Jordan 113,793.
Phosphorus		32,057	31,602	(2)	China 30,861; Netherlands 652.
Pigments, mineral, iron oxides and hydroxides processed		24,074	23,244	314	China 14,359; Germany 5,230; Sweden 1,385.
Precious and semiprecious stones, other than diamond:					
Natural	value, thousands	$147,245	$153,431	$4,601	Thailand $41,038; Hong Kong $34,098; Colombia $16,096.
Synthetic	do.	$17,928	$21,516	$11,044	China $3,082; Russia $1,444; Switzerland $1,296.
Pyrite, unroasted		7,491	9,951	--	All from China.
Quartz crystal, piezoelectric	value, thousands	$15,777	$20,943	$3,067	China $6,687; Thailand $3,528; Malaysia $3,376.
Salt and brine	thousand metric tons	7,493	8,066	2	Mexico 3,901; Australia 3,450; China 326.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	do.	113	105	1	China 23; India 18; Portugal 6.
Worked	do.	1,545	1,498	(2)	China 1,378; Italy 25.
Dolomite, chiefly refractory-grade	do.	2,367	2,347	(2)	China 1,173; Philippines 666; Thailand 485.
Gravel and crushed rock		235,843	246,363	706	China 103,975; Philippines 26,931; Other Asia, nes 98,336.
Limestone other than dimension	thousand metric tons	397	340	(2)	Malaysia 150; Viet Nam 97; Philippines 48.
Quartz and quartzite		155,693	163,408	4,821	India 57,486; Republic of Korea 51,407; China 33,188.
Sand other than metal-bearning and sand and gravel	thousand metric tons	6,448	6,307	6	China 4,395; Viet Nam 1,565; Australia 1,302.
Sulfur:					
Elemental:					
Crude including native and byproduct		1,080	1,672	--	Republic of Korea 888; China 784.
Colloidal, precipitated, sublimed		1,301	1,236	7	Republic of Korea 1,132; France 91; Germany 7.
Sulfuric acid		8,246	8,190	1	Republic of Korea 8,104; Other Asia, nes 84.
Talc, steatite, soapstone, pyrophyllite		345,215	300,924	4,783	China 272,412; Australia 17,407; Finland 4,095.
Vermiculite, perlite, chlorite		214,794	230,772	371	China 209,115; South Africa 17,895; Australia 1,717.
Other; slag and dross, not metal-bearing		616,742	492,862	476	Republic of Korea 150,701; South Africa 103,228; Other Asia, nes '47,467.

[r] Revised. -- Zero.

[1] Data presented in this table are from United Nations, Department of Economic and Social Affairs, Statistics Division

[2] Less than 1/2 unit.

The Mineral Industry of North Korea

By John C. Wu

The Democratic People's Republic of Korea (North Korea), which occupies the northern half of the Korean Peninsula, is located east of the Korean Bay, west of the Sea of Japan (the East Sea), south of China, and north of the Republic of Korea. The country's total area is about 120,540 square kilometers, or about the size of Pennsylvania. In 2004, its population was about 22.7 million. Its economy remained tightly controlled and centrally planned by the North Korean Government. The country's gross domestic product (GDP) and the GDP per capita based on purchasing power parity were estimated to be \$30.9 billion and \$1,400, respectively, in 2004 (U.S. Central Intelligence Agency, 2005§[1]).

The country's identified mineral resources are coal, copper, fluorspar, gold, graphite, iron ore, lead, limestone, magnesite (magnesium carbonate), pyrite, salt, silver, tungsten, and zinc. Reserves of coal, iron ore, limestone, and magnesite are large. The country, however, has very few known reserves of natural gas and crude petroleum (National Intelligence Service of the Republic of Korea, 2004§; U.S. Central Intelligence Agency, 2005§).

North Korea's real GDP was estimated to have grown by 2.2% in 2004. On the basis of North Korea's economic structure in 2004, the primary sector, which included agriculture and fishing, accounted for 26.7% of North Korea's GDP; the secondary sector, which included heavy industry (11.8%), construction (9.3%), mining (8.7%), light industry (6.7%), and public utilities (4.4%), accounted for 40.9%; and the tertiary service sector, which included Government (22.6%) and others (9.7%), accounted for 32.3% (Bank of Korea, 2005§).

The mining sector, which was dominated by the production of coal, iron ore, limestone, and magnesite, was important to the North Korean economy because of its significant contribution to the country's GDP. It provided fuel and raw materials to the country's manufacturing sector and also earned considerable amounts of foreign exchange.

Government Policies

The North Korean Government's economic policy guidelines were to build up a self-reliant national economy, promote the economic development with heavy industry as the top priority for development, and implement the policy of developing the national economy in parallel with strengthening the military (National Intelligence Service of the Republic of Korea, 2004§). In pursuing these policy goals, general consumption has been tightly controlled. As a result, the people have been forced to endure a shortage of goods and services. During the past several years, the shortages of food and electricity supply appear to have been severe, especially (with respect to electricity) because of the country's outdated thermal-power-generating facilities and insufficient coal supply.

The Government has been implementing its economic reform since July 2002. The reform measures included introducing market economy elements; phasing out the Government food rationing system; establishing general markets in major cities; designating Gaesong, Mount Geumgang, and Shinuiju as special economic zones; and sending professional groups abroad to learn about market economies. The Government has simultaneously implemented such supplementary measures as establishing state-owned food stores and wholesale department stores to stabilize the prices of rice and other daily necessities (Ministry of Unification of the Republic of Korea, 2004c§).

North Korea's environmental protection law was first passed in April 1986. The country was concerned about pollution and promoted environmentally friendly and antipollution policies. Section 11 of the Foreign Investment Law stipulated that foreign investments that are not environmentally friendly would be prohibited (Digital Kotrassistant, 2003b§)

Production

Production of coal and iron ore was mostly for domestic consumption by the iron and steel and utility industries. Considerable amounts of anthracite coal and iron ore, however, were exported. Limestone production was for consumption by the domestic cement and construction industries. Magnesite production was for further processing into magnesia clinker, which, in turn, was for consumption by the domestic metal manufacturing industries and for export. North Korea's other important minerals production included such nonferrous metals as copper, gold, lead, silver, tungsten, and zinc and such industrial minerals as barite, cement, fluorspar, graphite, phosphate rock, salt, sulfur, and talc (table 1). Most of the country's mining and mineral-processing activities have been operated at below their design capacity during the past several years because of outmoded facilities, a shortage of spare parts and energy (electricity and coking coal), and lack of capital for renovation and modernization.

Trade

North Korea's major export mineral commodities were cement, iron and steel products, iron ore, magnesia clinker, refined lead, and zinc metal. Additionally, certain percentages of the barite, refined copper, graphite, iron and steel, and sands production were exported during the past 5 years. North Korea's major import commodities were coking coal (metallurgical-grade bituminous coal), crude petroleum, and salt. Coking coal was imported mainly for consumption by the iron and steel industry, and salt was imported to supplement domestic production to meet the country's salt requirements. North Korea relied entirely on imports of crude petroleum to meet the raw material requirements of its two oil refineries. The country's major trading partners were China, Japan, the Republic of Korea, and Russia.

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[1] References that include a section mark (§) are found in the Internet References Cited section.

North Korea's eight major trade ports for handling minerals were Chongjin for coal and steel, Nampo for cement and coal, Hungnam for fertilizers and magnesia clinker, Najin for coal and fertilizer, Haeju for limestone, Sonbong for crude petroleum and refined petroleum products, Wonsan for cement, and Songnim for coal and iron ore. North Korea's three major operating domestic railroad networks were the Kaesung-Sariwon-Pyongyang-Shinuiju Line along the west coast; the Wonsan-Hungnam-Chongjin-Najin Line along the east coast; and the Pyongyang-Wonsan Line, which linked the east and west on the Korean Peninsula. Most of the North Korean railroads were linked with China and Russia (AsiaTradeHub.com, 2004§).

North Korea's major trading companies were all state-owned. Korea Ferrous Metals Export & Import Corp. exported iron ore, pellet, pig iron, and steel and imported cokes, ferroalloys graphite electrodes, and steelmaking supplies and materials. Korea Nonferrous Metals Export & Import Corp. exported such nonferrous minerals as copper, lead, tungsten, and zinc concentrates; such nonferrous metals as electrolytic zinc and cadmium; and such nonmetallic minerals as barite, granite, and talc. The company imported a wide variety of chemical products, machinery, equipment and supplies for mining and smelters. Korea Magnesia Clinker Export & Import Corp. exported bentonite, cyanite, magnesia bricks, magnesia clinker, magnesite, and talc and imported alloys, chromite, cokes, industrial oils, and mining machinery and supplies. Korea Building Materials Trading Corp. exported cement, ceramics products, and nonmetallic minerals. The company imported asbestos; caustic soda; cement-plant machinery, equipment, and supplies; fuels for the production of building materials; gypsum; and raw materials (Digital Kotrassistant, 2003a§).

Commodity Review

Metals

Gold.—Gumsan (Kumsan) Co., which was a joint-venture company of investors from Australia, England, and Singapore, started mining gold in October 2004. According to Singaporean investors, the joint-venture company mined ore from the Sierra deposit near Changjin, which is located northwest of Hamhung in the northeastern part of North Korea. The mined ore was milled near the mining site at an elevation of 2,000 meters. The milled ore was then transported through pipes to a processing plant that was located about 6 kilometers from the mine. The mine was to operate only 9 to 10 months per year because of the harsh weather conditions in the area and would produce about 220 kilograms (kg) of gold in 2004 and 530 kg in 2005 at full capacity. The proven ore reserves of the Sierra deposit were estimated to be in excess of 1 million metric tons (Mt), which contain about 4,700 kg of gold (Metal Bulletin, 2004; Ministry of Unification of the Republic of Korea, 2004b§).

Iron and Steel.—The iron and steel industry, which was the most important industry in the North Korean manufacturing sector, remained stagnant. Production of iron ore, pig iron, crude steel, and rolled steel was below design capacity because of the shortage of energy (coking coal and electricity) and the lack of spare parts and financial resources to renovate and modernize the outmoded iron and steel making facilities, which used equipment and technology of the 1970s and 1980s.

Iron ore production from the Musan Mine in North Hamgyong Province (Hamgyongbuk-Do), the Unryul Mine in South Hwanghae Province (Hwanghaenam-Do), the Tokhyong Mine in North Pyongan Province (Pyonganbuk-Do), and other smaller mines totaled about 4.6 Mt in 2004 (Bank of Korea, 2005§). Production of pig iron and crude steel was estimated to be 1 Mt and 1.1 Mt, respectively, in 2004. The major production facilities for iron and steel products were the Kimchek Iron Works, which was North Korea's largest, in Chongjin, North Hamkyong Province; the Hwanghae Iron Works, which was North Korea's second largest, in Songnim, North Hwanghae Province (Hwanghaebuk-Do); the Sungjin Steelworks in Kim Chek, North Hamkyong Province; and the Chullima Steelworks in Nampo, South Pyungan Province (Pyongannam-Do). Iron and steel remained one of North Korea's major export products (National Intelligence Service of the Republic of Korea, 2004§; Bank of Korea, 2005§).

Lead and Zinc.—Lead and zinc mining operations were mainly at the Komdok mining complex, which is located west of Tanchon in South Hamgyong Province (Hamgyongnam-Do); at the Sankok Mine near Kowon also in South Hamgyong Province; and at the Nakyon Mine in South Hwanghae Province. Lead and zinc smelting and refining operations were mainly at the Nampo complex in Pyongannan Province, the Munpong complex in Kangwon Province, and the Tanchon complex in South Hamgyong Province. The Nampo zinc smelter reportedly was dismantled in 2001 because of its pollution problems.

The country's combined production capacity of lead and zinc was estimated to be 380,000 metric tons per year (t/yr). Because of insufficient mining capacity that resulted from the shortage of electricity and spare parts, actual combined production of lead and zinc was estimated to be between about 80,000 and 82,000 metric tons (t). In recent years, exports of refined lead and zinc, which were valued at about $24 million per year, were exported to China, Japan, and the Republic of Korea. Exports of lead and zinc to the Republic of Korea were valued at about $22 million; and to China, Japan, and other countries, about $2 million (National Intelligence Service of the Republic of Korea, 2004§).

Industrial Minerals

Cement.—North Korea has abundant resources of limestone for cement production. Limestone resources were estimated to be 60 billion metric tons (Gt). Gypsum, which is the other main raw material, however, was mostly imported from overseas. Most cement plants were located near the limestone mines. The large-scale cement plants were located at Soonchun in South Pyongan Province with the capacity of 3 million metric tons per year (Mt/yr) and at Samgwon in Kangwon Province (Kangwon-Do) with the capacity of 2 Mt/yr. The country's cement industry comprised 30 plants and had a total capacity of about 12 Mt/yr. Actual cement production during the past 5 years was estimated to be between 4.6 Mt and 5.6 Mt owing to the shortage of coal and electricity (Ministry of Unification of the Republic of Korea, 2004a§; National Intelligence Service of the Republic of Korea, 2004§; Bank of Korea, 2005§).

Magnesium.—North Korea has the largest and some of the best quality magnesite deposits in the world (U.S. Library of Congress, 1993§). The country's magnesite resources, which were concentrated in North Hamgyong Province and South Hamgyong Province, were estimated to be 22 Gt. The two major magnesite mines in South Hamgyong Province were the 1.3-Mt/yr-capacity Dae Hung Mine (open pit) and the 1-Mt/yr-capacity Ryong Yang Mine (underground). The 200,000-t/yr-capacity Paek Bai Mine (underground) is located in the southern part of North Hamgyong Province. Most of the magnesite ore produced from the Dae Hung Mine and the Ryong Yang Mine was delivered by rail to a 750,000-t/yr-capacity plant in Tanchon, South Hamgyong Province for processing into magnesia clinker. Some portion of magnesite ore produced from the Dae Hung Mine was processed at the 150,000-t/yr clinker plant near the mine. Magnesite ore produced from the Paek Bai Mine was delivered to a 250,000-t/yr clinker plant in Song Jin, North Hamgyong Province for processing into magnesia clinker.

Magnesia clinker produced from the area contained a minimum magnesia oxide (MgO) content of 90% and a maximum silica (SiO_2) content of between 4.0% and 4.5% (Muk and others, 2003; National Intelligence Service of the Republic of Korea, 2004§).

Mineral Fuels

Coal.—North Korea has substantial reserves of anthracite coal, which were estimated to be 1.8 Gt, but fewer reserves of lignite (brown coal). The reserve of metallurgical-grade bituminous coal (coking coal), however, was small. The major coal resources are located in the Anju, the Kangdon, and the Sunchon areas of South Pyongan Province; the Paegam area of Yanggan Province (Yanggang-Do); and the Saebyol area of North Hamgyong Province (U.S. Library of Congress, 1993§).

The country produced 68 Mt of anthracite coal and 22 Mt of lignite in 1990 (U.S. Library of Congress, 1993§). Owing to the shortage of spare parts and the lack of financial resources to modernize the outmoded mining equipment and facilities, coal production during the past 5 years was much below that of 1990. Coal production stagnated at about 16 Mt/yr for anthracite and 7 Mt/yr for lignite during the past 5 years, but rebounded in 2004. Coal production was mostly consumed domestically for power generation; some coal, however, was exported to China and Japan to earn foreign exchange.

According to a local press report, exports of anthracite coal to China totaled 1.18 Mt for the first 9 months of 2004, which was more than double that for the same period in 2003. During the first 9 months of 2004, North Korea also exported 530,000 t of anthracite coal to its neighboring countries. Because of higher export prices, coal export earnings for the first 9 months of 2004 totaled $34.7 million compared with $1.08 million for the same period in 2003 (Korea Is One, 2004§).

Natural Gas and Petroleum.—North Korea has no documented reserves of natural gas and crude petroleum, although in the late 1990s, the Government claimed that it has enormous oil and gas reserves. Beach Petroleum of Australia, Soco International of the United Kingdom, and Taurus Petroleum of Sweden were allowed to explore for oil and gas offshore in the West Korea Bay basin, which is geologically analogous to China's Bohai Bay, but they failed to find viable oil reserves. In 2001, Petroliam Nasional Bhd. of Malaysia took over Block A, which had been held by Soco International. The Government awarded its first onshore block in the Tachon-Rajin area near the Chinese border to Sovereign Ventures of Singapore in November 2001. In September 2002, Sovereign Ventures reported its initial seimic survey results, which indicated the probable presence of oil and natural gas. Sovereign Ventures began exploratory drilling in 2003. In October 2003, Global GeoService (GGS) of Norway reportedly signed an agreement with the Government for offshore surveys and planned to begin initial survey in the first half of 2004. In June, state-owned Korea National Oil Corp. of the Republic of Korea reportedly was to participate in GGS's exploration project off North Korea's west coast (Oil & Gas Journal, 2004; Petroleum Economist, 2004; U.S. Energy Information Administration, 2004§).

In September 2004, Aminex Plc of the United Kingdom announced that it had signed a 20-year petroleum agreement with the Government of North Korea in June 2004 to assist in the development of the petroleum industry onshore and offshore North Korea. Under the terms of the agreement, Aminex would initially provide technical assistance to North Korea by assessing existing data, obtaining new data, advising with the drawing up of a framework for licensing exploration areas and for marketing the country's potential to the international oil industry, and providing training for the country's oil and gas specialists. In return, Aminex would receive a royalty on hydrocarbons produced from new drilling anywhere onshore or offshore North Korea and would be entitled to a carried working interest in any wells drilled by incoming companies. Aminex also would have a prior right to explore in its own name, either alone or with international industry partners, anywhere in the territory covered by the agreement (Petroleum Economist, 2004; Aminex PLC, 2004§).

Outlook

For the next 4 to 5 years, the North Korea mining sector will continue to be dominated by coal, iron ore, limestone, and magnesite. The opening of onshore and offshore oil and gas exploration to foreign companies in 2004, however, may lead to discovery of hydrocarbons in the Tachon Rajin area and offshore North Korea's west coast. The iron and steel industry is expected to remain stagnant, but the coal industry is expected to trend upward in the next 2 years because of rising energy prices.

North Korea's real GDP growth is expected to stay within the narrow range of between 2% and 3% during the next 2 years.

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TABLE 1
NORTH KOREA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2000	2001	2002	2003	2004
METALS						
Cadmium metal, smelter		200 [r]	200 [r]	200 [r]	200 [r]	200
Copper:						
Mine output, Cu content		12,000 [r]	12,000 [r]	12,000 [r]	12,000 [r]	12,000
Metal:						
Smelter, primary and secondary		12,000 [r]	12,000 [r]	12,000 [r]	12,000 [r]	12,000
Refinery, primary and secondary		15,000 [r]	15,000 [r]	15,000 [r]	15,000 [r]	15,000
Gold, mine output, Au content	kilograms	6,600 [r]	6,600 [r]	6,600 [r]	6,300 [r]	6,000
Iron and steel:						
Iron ore and concentrate, marketable:						
Gross weight	thousand metric tons	3,800	4,200	4,100	4,430	4,580
Fe content	do.	1,100	1,200	1,150	1,260	1,300
Metal:						
Pig iron	do.	800	800	800	900	900
Ferroalloys, unspecified	do.	10	10	10	10	10
Steel, crude	do.	1,000	1,000	1,030	1,090	1,070
Lead:						
Mine output, Pb content		9,000 [r]	9,000 [r]	10,000 [r]	20,000 [r]	20,000
Metal:						
Smelter, primary and secondary		9,000 [r]	9,000 [r]	10,000 [r]	20,000 [r]	20,000
Refinery, primary and secondary		7,000 [r]	7,000 [r]	6,000 [r]	7,000 [r]	7,000
Silver, mine output, Ag content		20 [r]	20 [r]	20 [r]	20 [r]	20
Tungsten, mine output, W content		500	500	600	600	600
Zinc:						
Mine output, Zn content		60,000 [r]	60,000 [r]	60,000 [r]	60,000 [r]	62,000
Metal, primary and secondary		65,000 [r]	65,000 [r]	65,000 [r]	65,000 [r]	67,000
INDUSTRIAL MINERALS						
Barite		70,000	70,000	70,000	70,000	70,000
Cement, hydraulic	thousand metric tons	4,600	5,160	5,320	5,540	5,630
Fluorspar		12,000 [r]	12,000 [r]	12,000 [r]	12,000 [r]	12,000
Graphite		30,000	25,000	25,000	25,000	25,000
Magnesite, crude	thousand metric tons	1,000	1,000	1,000	1,000	1,200
Nitrogen, N content of ammonia	do.	100	100	100	100	100
Phosphate rock		350,000	350,000	300,000	300,000	300,000
Salt, all types		500,000	500,000	500,000	500,000	500,000
Sulfur	thousand metric tons	41	41	42	42	42
Talc, soapstone, pyrophyllite		60,000 [r]	60,000 [r]	50,000 [r]	50,000 [r]	50,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand metric tons	16,000	16,000	17,000	16,000	16,300
Lignite	do.	6,500	7,000	7,000	6,300	6,500
Total	do.	22,500	23,000	24,000	22,300	22,800
Coke	do.	2,000	2,000	2,000	2,000	2,000

[r] Revised.

[1] Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2] Table includes data available through July 29, 2005.

[3] In addition to the commodities listed, crude construction materials, such as sand and gravel and other varieties of stone, and petroleum products presumably are produced, but available information is inadequate to make reliable estimates of output levels.

THE MINERAL INDUSTRY OF THE REPUBLIC OF KOREA

By John C. Wu

The Republic of Korea, which occupies the southern half of the Korean Peninsula below the 38th parallel, is located east of the Yellow Sea, west of the Sea of Japan (the East Sea), and between the Democratic People's Republic of Korea and Japan. Korea's total area is about 98,480 square kilometers, which is about the size of Indiana. In 2004, the country's population was estimated to be 48.4 million. Korea is a newly industrialized country in East Asia. The country's gross domestic product (GDP) and the GDP per capita based on purchasing power parity were estimated to be $1,029.8 billion and $21,305, respectively (International Monetary Fund, 2005§[1]; U.S. Central Intelligence Agency, 2005§).

Korea's mineral resources are limited. According to Korea Resources Corporation (Kores), which is a state-owned company under the supervision of the Ministry of Commerce, Industry and Energy, the country has small reserves of antimony, coal, copper, gold, iron ore, lead, molybdenum, silver, tin, tungsten, and zinc and relatively larger reserves of such industrial minerals as kaolin, limestone, pyrophyllite, silica stone (quartzite), and talc (Korea Resources Corporation, 2004, p. 117). Korea has small reserves of natural gas, but no known reserves of petroleum.

In 2004, Korea was one of the world's leading producers of cadmium and slab zinc and the world's fifth leading steel producer (World Bureau of Metal Statistics, 2005, p. 34; International Iron and Steel Institute, 2005a§). The country was a significant producer of cement, refined copper, phrophyllite, and talc in the Asia and the Pacific region. Korea was one of the region's major consumers and importers of coal, natural gas, and nickel oxide sinter; ores and concentrates of copper, iron, lead, and zinc; and crude petroleum. Because of its limited indigenous mineral resources, Korea relied almost 100% on imports to meet its requirements for bituminous coal; ores and concentrates of copper, iron, lead, rare earths, and zinc; fluorite; natural gas; gypsum; magnesite; crude petroleum; phosphate; and uranium.

Korea's mining and quarrying sector, which encompassed the mining of anthracite coal, ferrous and nonferrous metals, and industrial minerals, was the smallest sector of Korea's economy. According to Government statistics on national accounts, the output of the mining and quarrying sector accounted for only 0.33% of the country's GDP in 2004.

In 2004, the economy as measured by real GDP (in 2000 constant prices) grew by 4.6% compared with 3.1% in 2003 owing mainly to the strong growth in exports despite relatively weaker domestic demand and lower growth in fixed investments (Bank of Korea, 2005, p. 184).

Government Policies and Programs

Because of insufficient indigenous mineral resources, heavy reliance on imports, and the lack of a materials stockpile to draw upon in a potential resource crisis, the Government was actively promoting overseas exploration and development of mineral resources and seeking cooperative relations with resource-rich countries. The Government policy directions were (1) to set stable energy supply as a top national agenda, (2) to expand the investment fund for the development of energy and mineral resources, (3) to strengthen energy and mineral resource cooperation with countries of strategic importance, and (4) to strengthen the support base for the business sector in overseas resource development (Ministry of Commerce, Industry and Energy, 2005a, p. 1, 7).

To achieve the policy goal of energy security, the Government established the National Energy Committee to review support measures for overseas resources development and to draft and implement the second ten-year (2004-13) plan for overseas resource development. To achieve the policy goal of expanding the investment fund for the development of energy and mineral resources, new tax incentives were provided, the energy special fund and capital base were increased, the ceiling for the strategic fund of the Korea Export-Import Bank was raised, and the debt guarantee fund was established. To achieve the policy goal of strengthening cooperation with countries of strategic importance, the Government was actively pursuing resource diplomacy with resource-rich countries in Central Asia and Latin America and established a bilateral committee on energy and mineral resource cooperation. To achieve the policy goal of strengthening the support base for the business sector in overseas resource development, the competitiveness of specialized state-owned enterprises in the resource development field was enhanced to facilitate the participation of the private sector in attractive projects (Ministry of Commerce, Industry and Energy, 2005a, p. 11-14).

Production

In 2004, Korea produced a small quantity of a few metallic minerals and a relatively larger quantity of a wider variety of industrial minerals. The mine production of metallic minerals included gold, iron ore, lead, silver, and zinc. The mine production of industrial minerals included barite, feldspar, graphite, kaolin, limestone, mica, pyrophyllite, quartzite, sand, and talc. The country produced about 3 million metric tons (Mt) of anthracite and a small amount of offshore natural gas, but no crude petroleum. Korea manufactured large quantities of cement using domestic raw materials; iron and steel and refined petroleum products using imported raw materials, and moderate quantities of nonferrous metals, including bismuth, cadmium, copper, gold, lead, nickel, and zinc using mostly imported raw materials (table 1).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Trade

In 2004, total exports increased by 31.0% to $253.8 billion owing mainly to a 34.5% increase in exports of heavy industry products to $208 billion, which included mainly chemicals, iron and steel products, industrial machinery and precision equipment, electric and electronic machinery, passenger cars, and ships and boats. Total imports increased by 25.5% to $224.5 billion owing mainly to a 31.7% increase in imports of crude materials and fuel to $113.8 billion; these imports included mainly chemicals, light industrial crude materials, fuels, iron and steel products, nonferrous metals, and minerals (Bank of Korea, 2005, p. 108-109).

In minerals trade, Korea was a net importer of mineral commodities owing to its large imports of coal, natural gas, and crude petroleum; ore and concentrates of copper, iron, lead, and zinc; and ferrous and nonferrous metal products. In 2004, imports of mineral fuels totaled $49.4 billion, of which $29.9 billion was crude petroleum. Imports of nonfuel mineral products, which included iron ore; and ore and concentrates of copper, lead, zinc, and other minerals, totaled $7.5 billion. Imports of iron and steel products totaled $13.3 billion. Imports of nonferrous metals totaled $7.8 billion. Exports of crude materials and fuels totaled $13.1 billion, of which $10.3 billion was refined petroleum products. Exports of iron and steel products totaled $18.6 billion (Bank of Korea, 2005, p. 108-109).

Structure of the Mineral Industry

Korea's mining and quarrying sector consisted of small mining industries of coal, and ferrous and nonferrous metals and a relatively larger mining industry of industrial minerals. The mineral-processing sector, which consisted of the industries of ferrous and nonferrous metals, cement, and refined petroleum products, was much larger than the mining and quarrying sector (table 2). The mining and quarrying sector employed about 10,750 workers, of which about 6,600 were coal miners; about 4,010, industrial minerals miners; and about 140, metallic minerals miners. Most of the mining and quarrying companies and the ferrous and nonferrous metal processing companies were owned and operated by private companies incorporated in Korea. The larger coal mining, natural gas, petrochemical, and petroleum refining companies, however, were state-owned and under the supervision of the Ministry of Commerce, Industry and Energy.

In 2004, Korea Zinc Co. Ltd. completed construction of the 55-metric-ton-per-year (t/yr) indium-refining plant in Onsan. The plant was expected to start commercial operation in 2005. Korea's refined-gold production capacity increased to 110,000 kilograms per year (kg/yr) from 50,000 kg/yr owing to the inclusion of the 60,000-kg/yr-capacity gold refinery in Onsan that was operated by LG-Nikko Copper Inc. The country's primary zinc-refining capacity increased to 710,000 t/yr from 600,000 t/yr owing to the inclusion of the 30,000-t/yr-capacity expansion by Korea Zinc in Onsan and the 80,000-t/yr-capacity expansion by Young Poong Corp. in Sukpo. In 2004, Korea Zinc also increased its refined copper production capacity to 20,000 t/yr from 4,000 t/yr in Onsan.

Commodity Review

Metals

Aluminum.—Korea relied entirely on imports to meet its requirements for primary aluminum. In 2004, imports of primary aluminum increased by 10.8% to 1,197,062 metric tons (t), of which 943,413 t was primary aluminum ingot and 253,649 t was primary aluminum alloys. The major suppliers of primary aluminum ingots and alloys were China (42%), Russia (22%), Australia (17%), South Africa (5%), and Canada and United Arab Emirates (4% each) (World Bureau of Metal Statistics, 2005, p. 25).

According to Korea Nonferrous Metal Association, domestic demand for primary aluminum increased by 10.7% to 1.14 Mt, of which primary aluminum ingot increased by 12.3% to 930,900 t and primary aluminum alloys increased by 4.2% to 210,111 t in 2004. The major consumers were Alcan Thihan Aluminum Ltd., Aluminum of Korea Ltd., Choil Aluminum Manufacturing Co. Ltd., and Seoul Metal Co. Ltd. for the production of aluminum plates, sheets, electric wire, and aluminum alloy extrusion; Daihan Eunpakgy Industrial Co. Ld., Dong II Aluminum Co. Ltd., Lotte Aluminum Co. Ltd., and Sam-A Aluminum Co. Ltd. for the production of foil products; Dooray Air Metal Co. Ltd. for the production of aluminum wheels for automobiles and other casting products; and Chang Sung Corp. for the production of aluminum metal powders (Joo Ho Kim, Vice Chief, Korea Nonferrous Metal Association, oral commun., May 11, 2005).

Copper.—Korea was not a producer of mined copper, but was the third leading producer of refined copper in the Asia and the Pacific region. Korea relied 100% on imports of copper ore and concentrate to meet the raw material requirements for its Onsan copper smelter, which was located in Ulsan. The smelter was operated by LG-Nikko Copper Inc., which was formed in September 1999 by Korea's LG Group (50%) and Japan Korea Joint Smelting Co. (50%). Japan Korea Joint Smelting was owned 80% by Nippon Mining and Metals Co. Ltd. and 10% each by Marubeni Corp. and Mitsui Mining & Smelting Co. Ltd. In 2004, Korea imported about 1.31 Mt of copper ore and concentrates, which was valued at about $1.18 billion, from Argentina, Australia, Chile, Guinea, Indonesia, and Peru (Ministry of Commerce, Industry and Energy, 2005b, p. 304).

To secure a long-term stable supply of copper concentrate and refined copper, state-owned Kores and LG-Nikko Copper signed a joint-venture agreement with Chariot Resources Ltd. of Canada in October 2004 for the development of the proposed Marcona copper project in Peru. Under the joint-venture agreement, the Marcona copper project would be 70% owned by Chariot Resources and 30% owned jointly by Kores and LG-Nikko Copper, which agreed to offtake annually 90% of copper concentrate production from the Marcona project and 70% of

Marcona copper cathode production from the Target Area I and the Rio Tinto Plc claims (Mining Journal, 2004).

In November 2004, LG-Nikko Copper reportedly was expected to buy 60,000 t/yr of copper concentrate from Cia Vale do Rio Doce (CVRD) of Brazil from December 2004 to the end of 2011. According to Kores, LG-Nikko Copper and CVRD were expected to sign a memorandum of understanding (MOU) to develop the copper mine jointly (Bloomberg.com, 2004§; Yahoo! Inc., 2004b§). In November, LG-Nikko Copper extended its previous agreement with Wheaton River Minerals Ltd. to buy 120,000 t/yr of copper concentrate from the Alumbrera Mine in Argentina for 4 more years. The 4-year purchase agreement was worth about $400 million (JoongAng Daily, 2004§).

In 2004, the 420,000-t/yr Onsan copper smelter reportedly produced about 390,000 t of blister and anode copper. To feed the 450,000-t/yr Onsan copper refinery and the 60,000-t/yr Changhang copper refinery, Korea imported an additional 53,453 t of blister and anode copper and 205,427 t of copper and copper alloy scrap in 2004. Korea produced about 496,000 t of refined copper, of which about 60,000 t was secondary. To meet the domestic refined copper requirements, Korea also imported about 487,700 t of refined copper and about 2,700 t of copper alloys in 2004 (World Bureau of Metal Statistics, 2005, p. 70).

According to Korea Nonferrous Metal Association, domestic demand for copper cathode totaled 901,099 t in 2004. The country exported 46,145 t of copper cathode and imported 455,190 t of copper cathode in 2004. Most copper cathode was consumed by the semimanufacturers of brass, cable, plates, sheet, strip, tube, and wire. The major semimanufacturers of copper rod for electric wire, copper and copper alloy pipe, sheet, trip, and tube were Sun Jin Metal Co. Ltd. and Poongsan Corp. (Joo Ho Kim, Vice Chief, Korea Nonferrous Metal Association, oral commun., May 11, 2005)

Gold.—Ivanhoe Mines Ltd. of Canada began its gold mining operation in April 2002 at the Silver Hill Mine (Seongsan-Eunsan) in South Cholla Province (Chollanam Do) in southwest Korea. The Eunsan prospect is a low-sulfidation epithermal gold-silver prospect and was estimated to contain inferred resources of 252,800 t of ore at a grade of 15 grams per metric ton (g/t) gold and 83.8 g/t silver. Mine production of gold from the Silver Hill Mine was 233 kilograms (kg) in 2004, 207 kg in 2003, and 310 kg in 2002 [Lee, Kyung-Han, Principal Researcher, Mineral Economics Team, Korean Institute of Geoscience and Mineral Resources (Kigam), written commun., July 6, 2005].

In November 2004, CanAustra Resources Inc. of Canada agreed to acquire a 100% interest in a skarn gold prospect in Korea from an unnamed vendor (the mining title owner) for an undisclosed price. The gold prospect at an undisclosed location reportedly has extensively developed skarn host rocks with volume that has the potential to host a substantial outcropping gold deposit with significant copper and silver mineralization in four separate skarn zones. To determine the size and grade of the system, CanAustra planned to undertake a work program beginning in the first quarter of 2005 that would include a systematic data compilation, mapping, surface sampling, detailed soil sampling to delineate zones with anomalous gold, and drill testing of anomalous zones to determine the grade and width (ArriveNet.com, 2004§).

According to the Ministry of Commerce, Industry and Energy, Korea produced 32,449 kg of refined gold in 2004, of which 1,371 kg was produced from domestic raw materials, which included scrap. In 2004, domestic demand for refined gold was 91,093 kg. Imports of refined gold totaled 268,518 kg, which was valued at $3.49 billion; and exports of refined gold totaled 232,744 kg, which was valued at $2.98 billion (Ministry of Commerce, Industry and Energy, 2005b, p. 272, 294, 304). The major end users of refined gold were the manufacturers of coins, dental products, electrical communication parts, jewelry, materials for semiconductors, and other uses.

Indium.—Korea Zinc Co. Ltd., which was one of the world's leading producers of refined zinc, was expected to produce indium for the first time in Korea to meet the growing demand for liquid crystal display (LCD) panels. According to a company official, the company invested about $3.8 million to build an indium plant at its Onsan nonferrous metal smelting and refining complex. Construction of the indium plant was completed in December 2004. The initial plant capacity was 55 t/yr and would gradually increase to 100 t/yr if demand for indium were to continue to grow. The indium plant, which was scheduled to begin operation in January 2005, was expected to produce 34 t of indium in 2005. Indium is a byproduct of zinc refining that is used mainly to produce indium-tin oxide, which is an essential material in the manufacturing of LCD and plasma display panels (PDP) for flat-panel screens in computers, mobile phones, and televisions (Yahoo! Inc., 2004a§; C. K. Choi, Vice Chairman, Korea Zinc Co. Ltd., oral commun., May 12, 2005; Joo Ho Kim, Vice Chief, Korean Nonferrous Metal Association, oral commun., May 11, 2005).

Iron and Steel.—Korea relied on imports to meet more than 99% of its iron ore requirements in 2004. Imports of iron ore totaled more than 44 Mt and was valued at about $1.4 billion. The major suppliers were Australia (62%), Brazil (28%), and India (5%). The average import price of iron ore rose to $31.15 per metric ton in 2004 from $25.18 per metric ton in 2003. To secure a long-term stable supply of iron ore, Pohang Iron and Steel Co. Ltd. (POSCO) signed a 10-year purchase (sales) contract with CVRD (the world's leading producer of iron ore) for the supply of up to 103 Mt of iron ore fines from April 2005 to March 2015. The contract, which was worth $2.1 billion, was for CVRD to supply POSCO 8.5 Mt of iron ore in 2005; this amount would increase to 10.5 million metric tons per year (Mt/yr) in 2008 and remain at that level until the end of the contract. According to POSCO, its previous purchase, which totaled 36 Mt of iron ore under a 5-year contract with CVRD, will expire in March 2005 (Bloomberg.com, 2004§; Yahoo! Inc., 2004b§).

The iron and steel industry consumed 46.98 Mt of iron ore and produced about 28 Mt of pig iron in 2004. The industry consumed about 30 Mt of pig iron, of which about 2 Mt was imported; and consumed about 24 Mt of steel scrap, of which about 7 Mt of was imported. About 98% of pig iron was consumed for steelmaking, and 2%, for foundry use. Crude steel production increased to a record-high level of 47.5 Mt in 2004, of which about 56% was produced by basic oxygen furnaces (BOF) and 44%, by electric arc furnaces (EAF). At the end of 2003, the industry steelmaking capacity totaled about 49.3 Mt/yr, of which 27.4 Mt/yr-capacity was BOF and 21.9 Mt/yr-capacity was EAF (Korea Iron and Steel Association, 2004, p. 5-6, 8-9, 103, 122-23, 251, 258-259; Ministry of Commerce, Industry and Energy, 2005b, p. 106).

In 2004, Korea was the world's fifth ranked steel-producing country. The country's crude steel output accounted for about 4.5% of the world's total in 2004. Korea's two leading steelmakers—POSCO, which produced about 30.2 Mt, and INI Steel Co. Ltd., which produced about 7.6 Mt, ranked as the world's 5th and 28th leading steel-producing companies, respectively, in 2004 (International Iron and Steel Institute, 2005b§). The 2004 record-high level of steel production was mainly owing to a 4.5% increase in output by POSCO that was driven by stronger domestic demand for steel by the automobile and ship-building industries and by higher steel exports to China and Japan (Metal Bulletin, 2004b).

In August, POSCO signed a contract with Voest-Alpine Industrieanlagenbau (VAI) of Austria to build a FINEX plant at its Pohang works. FINEX is a new environmentally friendly ironmaking technology that has improved upon the Cores process developed by VAI. According to VAI, the $44 million contract was to build FINEX-processing facilities for large-scale production at the Pohang works. The FINEX plant would have the capacity to produce 1.5 Mt/yr of pig iron. FINEX simplifies the ironmaking process by direct application of fine iron ore. As a result, the emissions amount to only 10% of that generated when using conventional blast furnaces. The first commercial-scale FINEX ironmaking plant at POSCO's Pohang Works was scheduled to begin operations by the end of 2006 (Vatech.at, 2004§).

In August, POSCO planned to join with BHP Billiton Ltd. to build a new 10-Mt/yr slab plant in the State of Rissa in Eastern India. The joint-venture plan would involve the construction of a coke plant to process imported coal to be supplied by BHP Billiton and the development of a port, which would be undertaken by Tata Iron & Steel Co. of India. The exact location of the slab plant was yet to be determined (Metal Bulletin, 2004a).

Nickel.—Korea relied 100% on imports of nickel oxide sinter to meet the raw material requirements for the production of utility nickel (97% nickel content). In 2004, the major suppliers of nickel oxide sinter, which contained 75% to 76% nickel were, in decreasing order of volume, Japan (42%), Russia (24%), Canada (19%), and Australia (14%). Korea Nickel Corp., which was a joint venture of Korea Zinc Co. Ltd. (56%), Inco Ltd. of Canada (25%), and POSCO Steel Services and Sales Co. Lt. (19%), was the sole nickel refining company in Korea. The combined capacity of Korea Nickel's two nickel refineries in Onsan was 48,000 t/yr of utility nickel. The older plant, which had a 16,000 t/yr capacity, had not been in operation since 1999. The newer plant, which had a 32,000 t/yr capacity, was completed and began operations in October 1999. In 2004, because of a refractory brick problem in the main furnace, the main operating plant (the newer plant) reportedly was shut down from June to mid-December, and nickel refining was switched to the company's older standby plant. As a result, the 2004 production of utility nickel decreased to 27,200 t compared with 31,340 t in 2003 (Australia Paydirt, 2004; World Bureau of Metal Statistics, 2005, p. 116; Korea Zinc Co. Ltd., 2004§; Platts.com, 2004a§).

According to Korea Nonferrous Metal Association, demand for nickel metal totaled 123,112 t in 2004, of which 120,757 t was for domestic consumption mainly by the iron and steel industry and 2,355 t was exported mainly to China. To meet the overall demand for nickel, Korea imported 44,117 t of refined nickel and 50,885 t of nickel contained in ferronickel in 2004 compared with 38,826 t of refined nickel and 45,856 t of nickel contained in ferronickel in 2003. The increased imports of nickel in 2004 were a result of reduced domestic production and stronger demand for nickel by the iron and steel industry for stainless steel production (Joo Ho Kim, Vice Chief, Korea Nonferrous Metal Association, oral commun., May 11, 2005).

Zinc.—In 2004, Korea produced an insignificant amount of mined zinc and relied on imports for virtually all raw materials requirements for its zinc-refining industry. Imports of zinc ore and concentrate totaled, in gross weight, 1,253,051 t and were valued at $410.7 million. The major suppliers were Australia (30.6%), Peru (21.9%), and the United States (21.5%). Consumption of zinc ore and concentrate totaled 1,269,374 t in 2004 compared with 1,250,015 t in 2003 (Ministry of Commerce, Industry and Energy, 2005b, p. 272, 282, 304; World Bureau of Metal Statistics, 2005, p. 143).

Production of primary zinc totaled 669,000 t in 2004, of which 425,000 t was produced by Korea Zinc at Onsan, and 243,000 t, by Young Poong Corp. at Sukpo. In 2004, Korea, which was the world's leading producer of slab zinc, produced more than 940,000 t of slab zinc, of which 669,000 t was from the Onsan and the Sukpo plants in Korea, and 279,000 t, from two wholly owned subsidiaries of Korea Zinc (Sun Metals Corp. Pty., Ltd. in Australia, and Big River Zinc Corp in the United States).

According to Korea Nonferrous Metal Association, domestic demand for primary zinc (including unwrought zinc and zinc alloys, zinc bars, and rods, and other primary zinc products) decreased by 10.2% to 391,430 t in 2004. Exports of primary zinc in 2004 increased to 374,579 t from 363,983 t in 2003, and imports of primary zinc decreased to 109,572 from 147,369 t in 2003. Imports of primary zinc from North Korea in 2004 were 16,000 t compared with 37,000 t in 2003 and 23,000 t in 2002 (C. K. Choi, Vice Chairman, Korea Zinc Co. Ltd., oral commun., May 12, 2005; Joo Ho Kim, Vice Chief, Korea Nonferrous Metal Association, oral commun., May 11, 2005). According to the World Bureau of Metal Statistics, Korea consumed 420,013 t of slab zinc in 2004. It imported 71,633 t of slab zinc, of which 88% was from China, and exported 320,076 t of slab zinc, of which 25% went to Taiwan; 15%, to India; 9% each, to Indonesia and Vietnam; and 8%, to Malaysia in 2004 (World Bureau of Metal Statistics, 2005, p. 143).

Industrial Minerals

Cement.—Korea was the world's fifth leading cement producer in 2004 after China, India, the United States, and Japan. According to Korea Cement Industrial Association, the country's clinker output decreased to 48.3 Mt from 51.6 Mt in

2003, and cement output decreased to 54.3 Mt from 59.2 Mt in 2003 because of weaker domestic demand that resulted mainly from a slowdown in the construction of private housing in 2004. Exports of clinker increased to 1.4 Mt from 535,000 t in 2003, and exports of cement held steady at about 2.6 Mt. Exports of clinker went mainly to the United Arab Emirates (41%), Ghana (22%), and Vietnam (9%). Exports of cement went mainly to the United States (67%) and Japan (30%). The country imported only 22,000 t of clinker from Japan and imported 3.4 Mt of cement mainly from China (65%) and Japan (35%) (Korea Cement Industrial Association, 2005; 2005§).

Korea's cement industry comprised 11 companies that operated 51 kilns at 12 kiln plant sites and 26 grinding plants. The industry's total capacity was 70.2 Mt/yr. The industry's total number of employees was about 7,300. During the past 5 years, Korea's per capita cement consumption trended upward from 1,021 kg in 2000 to 1,217 kg in 2003 because of the continued growth in private housing construction; in 2004, however, the per capita cement consumption turned down to about 1,100 kg owing to the slowdown in new apartment construction (Korea Cement Industrial Association, 2004).

In October, Hanil Cement Co. Ltd., which was the country's sixth leading cement producer and was capable of producing more than 7 Mt/yr of cement, announced that it had signed an MOU with Mitsubishi Materials Corp. of Japan for close cooperation in all aspects of the cement businesses. Under the MOU, Mitsubishi Materials is to transfer technologies for manufacturing and for recycling of industrial wastes, and management "know-how" to Hanil Cement. The two companies also agreed to jointly foster growth in the global market. This was the first time that a Korean cement company had ever made an agreement with a Japanese company to collaborate on all aspects of the cement industry (Hanil Cement Co. Ltd., 2004§).

Mineral Fuels

Coal.—In 2004, anthracite coal production decreased to 3.2 Mt from 3.3 Mt in 2003 as the Government continued to restructure. The ongoing coal industry restructuring program was carried out under the Coal Mining Industry Act of 1988, which subsidized a portion of the expenses for mine closure. Between 1989 and 2000, about 340 coal mines were closed, about 33,400 coal miners lost their jobs, and the total estimated amount of Government subsidies was more than $400 million. The Government, however, continued to support the relatively more-efficient coal mines with funds to modernize their facilities and revamp their development methods. To balance the supply and demand for domestic coal, the Government constructed two anthracite coal-fired powerplants with a combined capacity of 400,000 kilowatts (kW) between 1989 and 1999 (Korea Resources Corp., 2004, p. 35).

In 2003 (the latest year for which data were available), a total of nine coal mines operated, six of which were privately owned, and three, state-owned; about 37% of coal was produced by the state-owned companies, and 63%, by privately owned companies. To meet the coal requirements for its cement, iron and steel, and utility industries, Korea imported a total of 65.3 Mt of coal, which was valued at about $2.3 billion. The major suppliers were Australia, Canada, China, Indonesia, and Russia (Korea Resources Corporation, 2004, p. 47-48). In 2003, Korea's iron and steel industry consumed about 18.9 Mt of coking coal, of which 18.7 Mt was imported. About 60.7% of imported coking coal was from Australia; 16.2%, from Canada; 1%, from the United States; and 22.1%, from other countries (Korea Iron and Steel Association, 2004, p. 108-109, 111).

Demand for bituminous coal totaled 60.3 Mt in 2000 and was projected to be 72.9 Mt in 2005. The main end users of bituminous coal were the cement industry, which consumed about 7.6 Mt in 2000 and was expected to consume 9.7 Mt in 2005; the utility (electricity-generating) industry, which consumed about 33.3 Mt in 2000 and was expected to consume 43.7 Mt in 2005; and the iron and steel industry, which consumed 19.4 Mt in 2000 and was expected to consume 19.5 Mt in 2005 (Korea Resources Corporation, 2004, p. 49).

To secure a long-term supply of coking coal, POSCO reached an agreement with Western Canadian Coal Corp. (WCCC) in December 2004, for the supply of 3 Mt of low-volatile pulverized coal-injection coal and hard-coking coal from WCCC's Burnt River and Perry Creek properties to POSCO's two steel works in Korea over a 6-year period. The long-term purchase and sale agreements, however, were subject to satisfactory trial shipments (Canada NewsWire Group, 2004§).

Natural Gas and Petroleum.—Korea produced a small amount of natural gas, but no crude petroleum; the country, however, was important to the world energy market. In 2004, Korea was the world's second leading importer of natural gas and the fifth leading importer of crude petroleum (U.S. Energy Information Administration, 2005§). In 2004, Korea continued to rely on imports for about 98% of natural gas requirements in the form of liquefied natural gas (LNG) for its utility industries and for all crude petroleum requirements for its petroleum refining industry.

On November 5, state-owned Korea National Oil Corp. (KNOC) began full-scale commercial production of natural gas from the country's first gasfield, Donghae-1, which is located 59 kilometers (km) offshore southeast of Ulsan in the Ulleung Basin. According to KNOC, Doghae-1 was discovered by KNOC in July 1998. The company spent between $300 million and $320 million to develop the gasfield, which was estimated to contain about 1.42 billion cubic meters (about 50 billion cubic feet) of high-quality natural gas and condensate reserves. When calculating in LNG, the gasfield has reserves of about 5 Mt. KNOC planned to produce 400,000 t/yr of natural gas over the next 15 years (Korea Gas Corp., 2004d§). Under a sale contract with state-owned Korea Gas Corp. (KOGAS), KNOC would supply up to 2.124 million cubic meters per day (75 million cubic feet per day), which is equivalent to 1,575 metric tons per day of LNG to KOGAS via KOGAS-managed pipelines. A 70-km pipeline that linked the gasfield to a gas treatment plant onshore and to the KOGAS pipeline network had been built by Hyundai Engineering & Construction Co. Ltd. (Platts.com, 2004b§).

Korea consumed between 20 Mt/yr and 21 Mt/yr of imported LNG mainly from, in decreasing order of amount imported, Qatar, Indonesia, Malaysia, and Oman. According to KOGAS, the rapid growth in demand for natural gas by the utility industry was causing the gap between projected LNG demand and guaranteed supply to grow. The projected shortfall of from 5 to 6 Mt in 2008 could increase to as much as 22 Mt by 2015. To secure sufficient long-term supply to fill the gap, the Government reportedly gave KOGAS the green light in July 2004 to negotiate new purchase contracts for up to 6 Mt/yr of LNG to be supplied over a 20- to 25-year period beginning in 2008, which was worth between $25 billion and $30 billion (Far Eastern Economic Review, 2004).

In August, KOGAS invited 11 LNG suppliers from 9 countries in the Middle East and the Asia and the Pacific regions to bid for long-term supply contracts to export LNG to Korea beginning in 2008. In October, KOGAS signed two long-term contracts with Brunei and Indonesia and two short-term LNG purchase agreements with Qatar and Malaysia. KOGAS was negotiating Heads of Agreements with the selected suppliers and planned to finalize the agreements by February 2005 (Korea Gas Corp., 2004 a§-c§).

Korea imported all crude petroleum requirements for its oil refining industry. In 2004, the country imports of crude petroleum averaged 2.836 million barrels per day (Mbbl/d), of which 2.033 Mbbl/d was from the Middle East; 0.046 Mbb/d, from Africa; and 0.132 Mbbl/d, from Asia. The major suppliers of crude petroleum were Saudi Arabia (30%), United Arab Emirates (18%), Kuwait (10%), Iran (7%), and Indonesia (5%). Demand for crude petroleum in 2004 averaged 2.149 Mbbl/d compared with 2.175 Mbbl/d in 2003. Korea's five major oil refineries were located in Ulsan (817,000 bbl/d), Yocheon (633,600 bbl/d), Onsan (520,000 bbl/d), Daesan (310,000 bbl/d), and Inchon (270,000 bbl/d). The country's total crude petroleum refining capacity was about 2.5 Mbb/d in 2004 (U.S. Energy Information Administration, 2005§). The country's second leading refinery, LG Caltex, which was owned jointly by LG Group and ChevronTexaco Corp., was completely shut down in mid-2004 because of a strike. The Inchon refinery, which was owned by Hyundai Oil Bank Co., might be taken over by Sinochem, China's state-owned oil and petrochemical trading company for about $550 million in 2004 (Petroleum Economist, 2004a, b).

Outlook

During the next 2 to 3 years, Korea's mining sector is expected to remain unchanged; the mineral processing sector, however, is expected to expand slightly in the iron and steel and nonferrous metals (especially in copper and nickel) industries. Korea is expected to more actively seek joint-venture exploration and development of mineral resources overseas, especially in coal, copper, natural gas, iron ore, and petroleum in the Latin American, Southeast Asian, and Eurasian countries.

Korea's economy as measured by the GDP is projected to grow at a slightly slower pace (4.0%) in 2005 and at a slightly faster pace (5.2%) in 2006 than in 2004 (International Monetary Fund, 2005§).

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TABLE 1
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS						
Bismuth, metal		71	106	69	120 [r]	156
Cadmium, smelter		1,911	1,879	1,825 [r]	2,175	2,362
Copper:						
Smelter, primary and secondary		424,100 [r]	428,500 [r]	430,000 [r]	460,000	430,000
Refined, primary and secondary		467,900	473,624	500,300 [r]	509,970	495,952
Gold:						
Mine output, Au content	kilograms	45	24	310	207	233
Metal, refined	do.	22,608 [r]	28,595	26,181	40,262	32,449
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	336	195	365	289 [r]	496
Fe content	do.	188	109	164	125 [r]	214
Metal:						
Pig iron	do.	24,938	25,898	26,570	27,314	27,556
Ferroalloys:						
Ferromanganese		146,373	143,525	137,000	141,000	165,525
Ferrosilicomanganese		103,522	101,877	94,000	90,942 [r]	82,917
Other		4,676	4,452	--	--	--
Total		254,571	249,854	231,000	231,942 [r]	248,442
Steel, crude	thousand metric tons	43,107	43,852	45,390	46,310	47,521
Lead:						
Mine output, Pb content		2,724	988	28	--	40
Metal, smelter		170,704	161,000	178,722	169,297	173,609
Nickel		29,890	26,429	30,337	31,340 [r]	27,200
Silver, metal	kilograms	591,130	664,533	973,140	947,781	1,172,632
Zinc:						
Mine output, Zn content		11,474	5,129	99	--	14
Metal, primary		473,897	503,315	600,027	644,218	668,666
INDUSTRIAL MINERALS						
Barite		30	200 [r]	78 [r]	140 [r]	50
Cement, hydraulic	thousand metric tons	51,424	52,046	55,514	59,194 [r]	54,330
Clays, kaolin	do.	2,049 [r]	2,306 [r]	2,727 [r]	3,009 [r]	2,780
Diatomaceous earth		34,143	27,530	20,666	15,636	2,441
Feldspar		378,817 [r]	467,161 [r]	519,125 [r]	477,012	541,788
Graphite, all tpyes		65	238 [r]	94	58	247
Lime, slaked lime		269,264	298,362	216,536	220,000 [e]	210,000 [e]
Mica, all grades		65,295 [r]	109,339	29,870	33,645	59,238
Nitrogen, N content of ammonia		386,300 [r]	385,200 [r]	152,600 [r]	118,900 [r]	163,400
Salt[e]		800,000	800,000	800,000	800,000	800,000
Soda ash, manufactured[e]		310,000	310,000	310,000	310,000	310,000
Stone, sand and gravel:						
Limestone	thousand metric tons	77,868	79,521	83,767	88,525	85,549
Quartzite	do.	2,321	2,377	3,041	2,966	2,842
Sand, including glass sand	do.	879	900	891	480	554
Sulfur, byproduct:[e]						
Metallurgy	do.	572	665	737 [r]	797 [r]	796
Petroleum	do.	679 [r]	690 [r]	687 [r]	757 [r]	879
Total	do.	1,251 [r]	1,355 [r]	1,424 [r]	1,554 [r]	1,675
Talc and related materials:						
Pyrophyllite		917,973	1,101,825	889,961	912,285	827,895
Talc		11,344	47,712	37,863	47,911	79,911

See footnotes at end of table.

TABLE 1--Continued
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		454,699	438,128	459,985	464,941	473,788
Coal, anthracite	thousand metric tons	4,174	3,817	3,318	3,312 r	3,248
Fuel briquets, anthracite briquets	do.	1,000 r, e	1,100 r, e	1,200 r, e	1,191 r	1,385
Petroleum refinery products	thousand 42-gallon barrels	911,761	930,000 e	940,000 e	796,000 r	842,000

eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. rRevised. -- Zero.

[1] Table includes data available through August 26, 2005.

Sources: Ministry of Commerce, Industry and Energy, Korea Institute of Geoscience and Mineral Resources, Current status of minerals supply and demand, 2004; U.S. Geological Survey, Minerals Questionnaire 2000-2004.

TABLE 2
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bismuth, metal	metric tons	Korea Zinc Co. Ltd.	Onsan	100
Cadmium	do.	do.	do.	2,000
Cement		Ssangyong Cement Industrial Co. Ltd.	Plants at Tonghae, Kwang Yang, Munkyung, Pukpyong, and Yeongwol	15,040
Do.		Sung Shin Cement Manufacturing Co. Ltd.	Tanyang plant	13,700
Do.		Tong Yang Major Corp.	Plants at Pukpyong and Samchok	11,580
Do.		Lafarge Halla Cement Corp.	Plants at Kwang Yang and Okkye	9,500
Do.		Hyundai Cement Co. Ltd.	Plants at Tanyang and Yongwol	8,600
Do.		Hanil Cement Manufacturing Co.	Plants at Chungbuk and Tanyang	7,200
Do.		Asia Cement Manufacturing Co. Ltd.	Plants at Daegu and Jaechon	4,600
Coal		Korea Coal Corp.	Mines at Changsung, Dogae, and Hwasoon	2,000
Copper, metal, primary		Korea Zinc Co. Ltd.	Onsan	20
Do.		LG-Nikko Copper Inc.	Changhang	60
Do.		do.	Onsan	450
Gas, natural		Korea National Oil Corp.	Ulleung Basin	NA
Gold:				
In concentrate	kilograms	Ivanhoe Mines Ltd.	Haenam, Cholla Province	1,600
Refined	do.	Korea Zinc Co. Ltd.	Onsan	50,000
Do.	do.	LG-Nikko Copper Inc.	do.	60,000
Graphite		Kaerion Graphite Ltd.	Kangwon	NA
Do.		Wolmyong Mining Co.	do.	NA
Indium, metal	do.	Korea Zinc Co. Ltd.	do.	55,000
Lead, metal, primary		do.	do.	200
Nickel, metal		Korea Nickel Corp.	do.	48 [1]
Steel, crude		Pohang Iron and Steel Co. Ltd.	Kwangyang (Gwangyang) Works	15,000
Do.		do.	Pohang Works	13,000
Do.		INI Steel Co.	Incheon Plant	4,800
Do.		do.	Pohang Plant	3,200
Do.		Dongkuk Steel Mill Co. Ltd.	Inchon Works	1,450
Do.		do.	Pohang Works	3,600
Do.		Kia Steel Co. Ltd.	Kunsan	720
Silver:				
In concentrate	kilograms	Ivanhoe Mines Ltd.	Haenam, Cholla Province	3,700
Refined	metric tons	Korea Zinc Co. Ltd.	Onsan	1,000
Do.	do.	LG-Nikko Copper Inc.	do.	330
Talc		Dongyang Talc Mining Co.	Chungju Mine	NA
Zinc, metal, primary		Korea Zinc Co. Ltd.	Onsan	430
Do.		Young Poong Corp.	Sukpo	280

NA Not available.

[1] Includes the 32,000-metric-ton-per-year (t/yr) operating plant and the 16,000 t/yr standby old plant.

THE MINERAL INDUSTRY OF MALAYSIA

By Pui-Kwan Tse

Malaysia is located next to Brunei, Indonesia, Singapore, and Thailand in Southeast Asia and is a member of the Association of Southeast Asian Nations (ASEAN). It has a total land area of about 328,600 square kilometers (km^2) and a population of about 25.6 million. In 2004, the Malaysian economy expanded by 7.1%, which was the highest annual rate of growth since the financial crisis in 1997. The gross domestic product (GDP) grew to $118.3 billion and the GDP per capita was $4,619 (Department of Statistics, 2005§[1]). Because the outbreak of severe acute respiratory syndrome (SARS) in Asia was contained and the Government issued various tax rebates and lowered interest rates in 2003, consumer confidence rebounded. Private consumption also contributed to the strong economic growth. During the year, all sectors except construction registered positive growth. Manufacturing production grew by only 9.8% because of the slowdown in global demand in semiconductors during the second half of the year. The rate of growth in the mining sector increased by 4.1% and was driven by higher outputs of natural gas and crude oil. The mining sector contributed 7.0% to the GDP and the natural gas and oil sector accounted for 95% of that contribution. As a result of the completion of several large infrastructure projects, the construction sector contracted by 1.9% in 2004 (Bank Negara Malaysia, 2005).

Government Policies and Programs

Because of the economic slowdown of the past several years, the Government focused on providing infrastructure and a better investment environment. The Government reformed the banking system and improved the delivery of Government services by reducing red tape and lowering the cost of doing business in Malaysia. The Government moved from supporting large prestige projects to funding smaller ones that have a higher multiplier effect and has put greater emphasis on diversifying sources of growth into sectors such as services and agriculture (Bank Negara Malaysia, 2005).

Malaysia is a federation that consists of 14 States and 3 Federal territories. Mineral resources belong to the States and each State takes responsibility for the approval and issuance of exploration licenses and mining rights within its border. In the late 1980s, owing to a decline in metal prices, many tin mines were shut down. During the past couple of years, metal prices increased and the Federal Government urged the miners to revive their abandoned mines. The Government also focused on developing the country's industrial mineral resources. The Federal Government urged the State governments to join in developing the mining sector and encouraged the States to issue more mining licenses in Malaysia (Malaysian Tin Bulletin, 2004).

Production

Malaysia produced bauxite, coal, feldspar, gold, ilmenite, iron ore, kaolin, mica, monazite, natural gas, oil, sand and gravel, struverite, tin, and zircon. Owing to higher tin prices in the Kuala Lumpur Tin Market and the international market, production of tin metal increased; because of depleting ore reserves and lower ore grades, however, output of tin concentrates dropped to a historical low. Because of increased demand for fertilizers from the plantation sector, the output of fertilizers increased. The shortage of steel products in the global market and the demand growth in the domestic market caused the Malaysian iron and steel sector to increase its output in 2004.

Trade

In 2004, Malaysia's total trade increased by 22.9% to $231.7 billion. Exports increased by 20.5% to $126.5 billion, and imports increased by 25.7% to $105.2 billion. The ASEAN countries, which remained Malaysia's largest export market, accounted for 25.5% of the total exports, of which Singapore received 15.0%. Other major export markets included the United States, 18.8%; Japan, 10.1%; China, 6.7%; and Hong Kong, 6.0%. Electrical and electronic products accounted for 64.1% of manufactured product exports. The share of mining products was 11.5% of the total exports. Exports of crude oil and liquefied natural gas (LNG) increased in 2004 compared with those of 2003. The export value of crude oil and LNG increased to $6.0 billion and $7.1 billion, respectively. Malaysia imported goods from ASEAN countries, 24.0%; Japan, 15.9%; the United States, 14.5%; China, 9.8%; and Taiwan 5.4%. Mining goods accounted for 6.6% of the total imports. The imported values of refined petroleum products and crude petroleum were $3.8 billion and $2.0 billion, respectively (Ministry of International Trade and Industry, 2005).

Besides oil and natural gas, Malaysia's mineral sector was small, and the country imported metallic and nonmetallic minerals to meet its demand. In 2004, total exports of major minerals were valued at $424 million, of which $289 million was for tin. Imports of major minerals totaled $1.1 billion. Iron and steel products were the leading traded mineral commodities followed by copper, gold, and aluminum (Minerals and Geoscience Department, 2004, p. 7-9; Ministry of International Trade and Industry, 2005).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Commodity Review

Metals

Aluminum.—Malaysia bauxite resources are located at Bukit Batu, Bukit Gebong, Lundu-Semantan, and Tanjung Seberang in the State of Sarawak and at Bukit Mengkabau and Labuk Valley in the State of Sabah. The two operating bauxite mines in Malaysia were located at Bungai Rengit in the State of Johor. Owing to depleted resources, bauxite production decreased by more than 90% to about 2,000 metric tons (t) in 2004 from its highest level of 279,066 t in 1997 (Minerals and Geoscience Department, 2004, p. 12).

Malaysia did not have an aluminum smelter and imported unwrought aluminum to meet its demand. Investors from Bahrain, China, the United Arab Emirates, and the United States had submitted proposals to the Malaysian Government to build aluminum smelters in Malaysia. The 500,000-metric-ton-per-year (t/yr) aluminum project by Smelter Asia Sdn. Bhd. and its partners at Similajau in Sarawak was expected to begin construction in the second half of 2005 and to be completed by September 2007. The company projected that the smelter would produce 127,000 t of aluminum ingot in 2007 and would reach full capacity in 2011. Power for the smelter will be supplied by the Bakun hydroelectric powerplant. The company planned to source alumina from Australia and the United States (Minerals and Geoscience Department, 2004, p. 16).

Cahya Mata Sarawak Bhd of Malaysia and China's China Hydro Corp. and Shandong Luneng Group signed a memorandum of understanding to jointly build a 500,000-t/yr aluminum smelter in Sarawak. China Hydro and the Sime Darby Bhd-led Malaysian consortium were to jointly build the Bakun Dam in Sarawak, which would have a capacity of up to 2,400 megawatts of electricity. The construction cost of the Bakun Dam was estimated to be $1.8 billion, and that of the aluminum smelter, about $1 billion. The smelter was expected to begin producing aluminum ingot in 2007 (Malaysia Industrial Development Authority, 2005a§).

Gold.—In the past several years, Malaysia's gold production was about 4 t (table 1). Gold output was mainly from the Penjom Mine, which was owned by Avocet Mining PLC and operated by its wholly owned subsidiary Specific Resources Malaysia Sdn. Bhd.; the mine was located at Penjom in the State of Pahang. Several small-scale gold mines were located in the States of Kelantan, Pahang, and Terengganu.

Owing to downtime that resulted from maintenance and the installation of a new Knelson concentrator in 2004, mill output was down by 6% from the previous year. Also as a result of downtime, the output of gold from the Penjom Mine decreased slightly to 3,727 kilograms (kg) in the fiscal year that ended on March 31, 2005, from 3,869 kg in the fiscal year that ended on March 31, 2004. The average ore grade was 7.92 grams per metric ton (g/t) gold and the recovery rate was 89%; this output was higher than the average ore grade of 7.73 g/t and lower than the 90% rate of recovery during 2003. The production cost increased by 6% to $203 per ounce ($6.13 per gram). In 2004, Avocet continued its exploration activities near its mine site and identified additional resources in the central and northern sectors of the Kalampong pit area. The company increased its interest in Damar Consolidated Exploration Sdn Bhd to 100% from 62% for the cash payment of $300,000. Damar held the Buffalo Reef prospect, which is located about 40 kilometers northeast of Penjom. About 3 t of gold was identified near the surface and could be mined and processed for a modest capital cost. In 2005, Avocet planned to invest $1 million to explore around the Kalampong pit area (Avocet Mining PLC, 2005, p. 10-14).

Iron and Steel.—Malaysia produced small amounts of low-grade iron ore from the States of Pahang, Perak, and Terengganu. Domestic iron ore output was consumed by domestic pipecoating plants and cement plants. The country imported high-grade iron ore from Bahrain, Brazil, Canada, and Chile for ironmaking. State-owned Perwaja Steel Sdn. Bhd. produced direct-reduced iron (DRI) at the plant at Kemaman in the State of Terengganu; the plant had a designed output capacity of 1.2-Mt/yr. Lion Diversified Holdings planned to build a 1.54-Mt/yr DRI plant in Banting Salangor in 2005. Hot-briquetted iron (HBI) was produced by Amsteel Mills Sdn. Bhd. at the plant located on Labuan Island; the plant had a designed output capacity of 720,000 t/yr. Malaysia's production of DRI and HBI totaled 1.68 Mt in 2004 compared with 1.60 Mt in 2003 (Midrex Technologies, Inc., 2005).

The shortage and higher price of steel scrap in the international market affected the iron and steel industry in Malaysia. The country produced less than 5 Mt/yr of crude steel, but consumed about 8 Mt/yr; the shortage of crude steel was met by imports. Because of escalating crude steel and steel scrap prices on the international market, Malaysia's steel semimanufacturing producers operated below their designed output capacities. The major steel producers were Amsteel Mills, Antara Steel Mill Sdn Bhd., Malayawata Steel Bhd., Malaysia Steel Works (KL) Sdn. Bhd. (MSW), Perwaja Steel, and Southern Steel. The industry's total installed capacity of billet was 5.25 Mt in 2002; the capacity utilization, however, was about 60% during the past few years. Imports of billet were regulated by the Government and allowed only when there was a shortage of billet to meet domestic demand or certain grades of billet were not produced locally. Malaysia had a total rolling capacity for finished long products of about 7.2 Mt in 2003, but capacity utilization was about 50%. Domestic steel demand was expected to increase, and the tsunami disaster in neighboring countries, such as Indonesia and Thailand, was expected to benefit Malaysia's construction and building materials companies. The Malaysian Iron and Steel Industry Federation projected that Malaysia's steel consumption would be 8.8 Mt in 2005, 9.7 Mt in 2006, and 10.6 Mt in 2007 (Malaysian Iron and Steel Industry Federation, 2003, p. 31-80).

MSW had two plants—a 250,000-t/yr rolling mill in Petaling Jaya and a 350,000-t/yr crude steel plant in Bukit Raja. The capacity utilization rate of the crude steel plant was about 67% in 2004. The rolling-mill capacity utilization rate to produce high-tensile deformed bars and round bars was about 62%. MSW exported about 30% of its products to ASEAN markets. MSW planned to invest $31.6 million to add a 150,000-t/yr rolling mill at Bukit Raja in the State of Klang. The new rolling mill would produce high-quality steel products, which would include angles, flat bars, and wire rods. Construction of the new mill was scheduled to begin in 2005 and to be completed in 2007 (Malaysia Industrial Development Authority, 2005b§).

Tin.—Owing to depleted resources and lower ore grades, Malaysia's tin mine production continued to decline despite a higher tin price in 2004. The Malaysian Chamber of Mines planned to review a 5-year plan to revive Malaysia's dwindling tin mining sector. Malaysia's major tin deposits are located along the western coast of Peninsular Malaysia in the States of Perak and Selangor. At yearend 2004, the stock of tin in the London Metal Exchange (LME) warehouse declined to 8,160 t, which was the lowest level in 5 years. In the Kuala Lumpur Tin Market (KLTM) and the LME, the average tin price rose to about $8,500 per metric ton in December 2004 from about $6,000 per metric ton in December 2003. The total number of operating tin mining areas in Malaysia decreased to 23 in 2004 from 26 in 2003 (Malaysian Tin Bulletin, 2005).

After the closure of Escoy Smelting Sdn Bhd in 1998, Malaysia Smelting Corp. Bhd. (MSC) was Malaysia's sole integrated tin producer and the leading tin metal producer in the world. In 2004, MSC produced a total of 57,270 t of tin ingot from its two smelters, Butterworth in Malaysia (33,740 t) and PT Koba Tin in Indonesia (23,530 t). MSC Straits' refined tin brand, which was registered at KLTM and LME, ranged in purity from the standard grade A (99.85% Sn) to the premium grade electrolytic tin (99.99% Sn). To secure tin resources, MSC expanded its investments in Indonesia through its subsidiary PT MSC Indonesia and increased its interest in Bluestone Tin's Renison Bell tin mine in Tasmania, Australia. In 2004, Malaysia consumed about 4,600 t of tin. The solder and the tinplating sectors continued to be the major tin consumption sectors. In 2004, Malaysia exported 28,929 t of tin metal to (in descending order of amount received) Singapore, the Republic of Korea, Japan, Taiwan, and the United States. Malaysia's imports of tin concentrates were 18,916 t in 2004, 20,183 t in 2003, and 31,788 t in 2002 (Malaysia Smelting Corp. Bhd., 2005, p. 3, 26-28, 98-99). According to domestic production and trade data, the total supply of tin in tin concentrates in the Malaysian market (usually the tin content of imported tin concentrate was about 50%) appeared to be insufficient to meet the demand for tin metal production in the country. The gap between supply and demand of tin concentrates was met either from stockpiles in Malaysia or from unreported imported tin concentrates. China was the leading tin metal producing country in the world. Owing to economic expansion, China's consumption of tin metal increased during the past several years. As a result of increased consumption, exports of tin metal from China have decreased gradually during the past several years. Indonesia and Malaysia have increased their exports of tin, which could influence the price of tin on the international market in the future.

Industrial Minerals

Cement.—In 2004, cement production continued to increase because of the continued growth in demand. The shortage of sand in Malaysia affected the cement sector. The Federal Government stopped issuing licenses to companies to dredge sand along coastal areas. Existing sand licenses issued by the Land and Cooperative Development Ministry would not be renewed when they expired because the operations posed threats to marine ecology in Malaysia. The shortage of concrete-based materials affected the construction sector (Star, The, 2004).

Malaysia's leading cement producer, Lafarge Malayan Cement Bhd., planned to increase its cement grinding capacity at its Rawang plant by 800,000 t/yr. The company also planned to move its idle cement grinding plant in Langkawi to Rawang. The addition of cement grinding capacity in Rawang could reduce the logistic costs of shipping cement from Langkawi to the mainland. Excess clinker from the company's Perak plant was exported. After completion of the grinding expansion in Rawang, excess cement in Langkawi will be exported (International Cement Review, 2004).

Mineral Fuels

Coal.—Malaysia's coal resources are located in the States of Perak, Perlis, Sabah, Sarawak, and Selangor. Coal was produced from the areas of Bintulu, Merit-Pila, Silantek, and Tutoh in Sarawak. The country has coal reserves of 1.7 billion metric tons (Gt), of which about 1.4 Gt is in Sarawak. Merit-Pila was the largest coalfield in Malaysia. Malaysia produced less than 500,000 t of coal annually, but consumed more than 5 Mt; as a result, the country imported more than 5 Mt of coal each year to meet the demand. The power-generating plants consumed about 70% of the total supply of coal (domestic production and imported) and the remaining was consumed by the cement and iron and steel sectors. Tenaga National Berhad planned to change its natural gas powerplants into coal-fired powerplants in the next several years, and the usage of gas in their powerplants was expected to decrease to 49% from 72% in 2010. Major coal-fired powerplants under construction included Tanjung Bin and Jimah; Prai Power and the second phase of Port Dickson Power were under development. The demand for coal in Malaysia was expected to increase, and because domestic coal could not meet the demand, the country was expected to increase coal imports to fill the gap. Most of imported coal was from Australia, China, and Indonesia (Minerals and Geoscience Department, 2004, p. 100).

Natural Gas and Petroleum.—Malaysia remained a net exporter of natural gas and crude oil. The average production of natural gas increased to 147 million cubic meters per day in 2004 from 142 million cubic meters per day in 2003. Production of crude oil and condensate increased to an average of 762,000 barrels per day (bbl/d) in 2004 from 738,000 bbl/d in 2003. The country exported about 50% of its natural gas in the form of LNG and crude oil and condensate production (Bank Negara Malaysia, 2005§).

Shell Malaysia (a unit of Royal Dutch/Shell Group) discovered a potential large oilfield from its Gumusut-1 exploration well, which was located off the coast of the State of Sabah. Gumusut was located in Block J, in which Shell Malaysia and ConocoPhillips Corp. of the United States each held 40% interest, and Malaysia's state-owned Petronas held the remaining 20%. The Government of Brunei awarded nearly the same areas to Shell and a consortium led by Total of France.

The Malaysia Navy ordered the Total exploration team to stay away from the disputed area. The Governments of Brunei and Malaysia were in negotiations to resolve the disputed area and proposed to create a production-sharing agreement. Shell also explored in Block G (ASEAN Center for Energy, 2004§).

In 2002, Murphy Oil Corp. of the United States discovered the first deepwater oilfield in Malaysia, which was estimated to have between 400 million and 700 million barrels of recoverable reserves in Block K of Sabah. Murphy held an 80% interest in Block K, which covered more than 8 million acres. Petronas Carigali Sdn. Bhd. (a subsidiary of Petronas) held the remaining 20%. Murphy planned to bring the oilfield onstream in 2007. In 2003, Murphy signed production-sharing contracts on Block L and Block M, in which the company held 60% and 70% interest, respectively; Petronas held the remaining interest (Petroleum Economist, 2004).

Petronas discovered a new gasfield offshore Block SK310, which is located 130 km northwest of Miri, Sarawak. The natural gas has hydrogen sulfide content of 35 parts per million and a carbon dioxide level of 7% (Petroleum Economist, 2005).

If Malaysia's economy continues to grow in the next several years, the consumption of oil and gas is expected to increase. The Asian Development Bank projected that Malaysia's GDP will increase by 5.1% in 2005, 5.3% in 2006, and 5.8% in 2007. Most of Malaysia's oil production was from shallow waters near Peninsular Malaysia. Malaysia and Thailand shared offshore prospects in the Joint Development Area, which was the important source of natural gas. Malaysia could become a net oil importer in the near future if there are no major discoveries. The Malaysian Government planned to lease more deepwater blocks to foreign investors for exploration near the States of Sabah and Sarawak (Asian Development Bank, 2005, p. 48).

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Major Source of Information

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Major Publications

Department of Statistics [Malaysia]:
  Statistical Bulletin, Malaysia, monthly.
  Yearbook of Statistics, Malaysia, annual.
Malaysian Chamber of Mines: Annual Report, annual.
Malaysia Tin Bulletin, monthly.
Minerals and Geoscience Department [Malaysia]:
  Annual Report and Malaysia Minerals Yearbook, annual.
  Monthly Statistics on Mining Industry in Malaysia, monthly.

TABLE 1
MALAYSIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
METALS						
Aluminum, bauxite, gross weight		123,270	64,161	39,975	5,732	2,040
Columbium-tantalum metals, struverite, gross weight		969	8,430	2,298	2,619	121
Gold, mine output, Au content[3]	kilograms	4,026	3,965	4,289	4,739	4,221
Iron and steel:						
Iron ore, gross weight		258,573	376,476	404,350	596,612	663,732
Pig iron, direct-reduction iron and hot-briquetted iron	thousand metric tons	1,260	1,120	1,080	1,600	1,680
Steel, crude	do.	3,650	4,100	4,722	3,960 [r]	4,200 [e]
Lead metal, secondary[e]		35,300	38,000	40,000	40,000	40,000
Rare-earth metals, monazite, gross weight		818	643	441	795	1,683
Silver, mine output, Ag content[3]	kilograms	5	3	--	--	364
Tin:						
Mine output, Sn content		6,307	4,972	4,215	3,359	2,745
Metal, smelter		26,228	30,417	30,887	18,250	33,914
Titanium:						
Ilmenite concentrate, gross weight		124,801	129,750	106,046	95,148	61,471
Dioxide[e]		46,000	50,000	56,000	56,000	56,000
Zirconium, zircon concentrate, gross weight		3,642	3,768	5,292	3,456	6,886
INDUSTRIAL MINERALS						
Barite		7,274	649	3,082	--	--
Cement, hydraulic	thousand metric tons	11,445	13,820	14,336	17,243	22,833
Clays and earth materials	do.	79,485	29,596	23,092	23,909 [r]	24,221
Clays, kaolin		233,885	364,458	323,916	425,942 [r]	326,928
Feldspar		29,895	40,509	30,819	42,662 [r]	79,220
Mica		3,835	4,107	3,669	3,609	3,544
Nitrogen, N content of ammonia		604,800	726,000	847,900	909,500	842,500
Sand and gravel	thousand metric tons	21,497	15,020	19,574	17,955 [r]	18,371
Silica sand, peninsular Malaysia and Sarawak		446,838	575,105	447,398	533,617 [r]	631,402
Stone:						
Aggregate	thousand metric tons	66,670	66,996	84,934	85,142 [r]	51,236
Dolomite		4,030	2,850	--	--	--
Limestone	thousand metric tons	26,086	32,503	27,450	20,855 [r]	19,968
MINERAL FUELS AND RELATED MATERIALS						
Coal		382,942	497,733	352,513	172,820	389,176
Gas, natural:[4]						
Gross	thousand metric tons	56,929	58,751	60,791	65,173	67,530
Net[5]	do.	45,259	46,707	48,329	51,813	53,688
Liquefied natural gas	thousand metric tons	15,169	15,423	15,007 [r]	17,311 [r]	20,729
Petroleum:[4]						
Crude and condensate	thousand 42-gallon barrels	249,159	243,696	254,770	269,370	279,009
Refinery products[e, 6]	do.	135,000	142,000	144,000	142,000	144,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Table includes data available through September 29, 2005.

[2] In addition to the commodities listed, a variety of crude construction materials, which include clays and stone, fertilizers, and salt, is produced, but not reported, and information is inadequate to make reliable estimates of output levels.

[3] Includes byproduct from tin mines in peninsular Malaysia and gold mines in peninsular Malaysia and Sarawak.

[4] Includes production from peninsular Malaysia, Sabah, and Sarawak.

[5] Gross less volume of reinjected and flared.

[6] Includes liquefied petroleum gas, lubricants, and naphthas.

Sources: Ministry of Primary Industry, Minerals and Geoscience Department (Kuala Lumpur), Malaysian Minerals Yearbook 2004, Monthly Statistics on the Mining Industry in Malaysia; Department of Statistics (Kuala Lumpur), Monthly Statistical Bulletin, April 2004; U.S. Geological Survey Minerals Questionnaire, 2004; and Southeast Asia Iron and Steel Institute, Steel Statistical Yearbook, 2003.

TABLE 2
MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bauxite		Johore Mining and Stevedoring Co. Sdn. Bhd. (ALCAN Ltd. of Canada, 61%, and local investors and other, 39%)	Teluk Rumania and Sg. Rengit, Johor	400
Cement[1]		Cement Industries of Malaysia Bhd. (United Engineers Malaysia Bhd., 53.97%, and others, 46.03%)	Kangar, Perlis	2,000; 1,600*
Do.		Lafarge Malayan Cement Bhd. (majority-owned subsidiary of Lafarge S.A.)	Rawang, Selangor; Kanthan, Perak, Langkawi, Kedah; and Pasir Gudang, Johor	12,800; 7,900*
Do.		Negeri Sembilan Cement Industries Sdn. Bhd. (wholly owned subsidiary of Cement Industries of Malaysia Berhad)	Bahau, Negeri Sembilan	1,400; 1,200*
Do.		Pahang Cement Sdn Bhd. (50-50 joint venture of Pahang State government and YTL Cement Berhad)	Bukit Sagu, Pahang	1,300; 1,200*
Do.		Perak-Hanjoong Simen Sdn. Bhd. (Gopeng Bhd., 45%, and Korea Heavy Industries and Construction Co. and others, 55%)	Padang Rengas, Perak	3,400; 3,000*
Do.		Tasek Corp. (publicly owned company)	Ipoh, Perak	2,300; 2,300*
Gas:				
Natural	million cubic meters per day	ExxonMobil Exploration and Production Malaysia, Inc.	Offshore Terengganu	45
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	3
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	80
Liquefied		Malaysia LNG Sdn. Bhd. (Petroliam Nasional Berhad, 65%; Shell Gas N.V., 15%; Mitsubishi Corp., 15%; Sarawak State government, 5%)	Tanjung Kidurong, Bintulu, Sarawak	8,100
Do.		Malaysia LNG Dua Sdn. Bhd. (Petroliam Nasional Berhad, 60%; Shell Gas N.V., 15%; Mitsubishi Corp., 15%; Sarawak State government, 10%)	do.	7,800
Do.		Malaysia LNG Tiga Sdn. Bhd. (Petroliam Nasional Berhad, 60%; Shell Gas N.V., 15%; Nippon Oil LNG (Netherlands) BV, 10%; Sarawak State government, 10%; Diamond Gas Netherlands BV, 5%)	do.	6,800
Gold, refined	kilograms	Specific Resources Malaysia Sdn. Bhd. (joint venture of Pahang State Development Corp. and Avocet Mining plc of the United Kingdom)	Penjom, Pahang	4,000
Iron and steel:				
Hot-briquetted iron		Amsteel Mills Sdn. Bhd. (wholly owned subsidiary of Amsteel Corp.)	Labuan Island, offshore Sabah	800
Direct-reduced iron		Perwaja Steel Sdn. Bhd. (Maju Holdings Sdn. Bhd., 51%; Lion Group, 30%; Terengganu State government, 19%)	Kemaman, Terengganu	1,200
Crude steel		Amsteel Mills Sdn. Bhd. (wholly owned subsidiary of Amsteel Corp.)	Klang, Selangor	750
Do.		Perwaja Steel Sdn. Bhd. (Maju Holdings Sdn. Bhd., 51%; Lion Group, 30%; Terengganu State government, 19%)	Kermaman, Terengganu	800
Do.		Southern Steel Bhd. (Camerlin [a member of Hong Leong Group Malaysia], 40.75%; Natsteel Ltd., 27.03; other, 32.22%)	Prai, Penang	1,200
Nitrogen, ammonia		Asean Bintulu Fertilizer Sdn. Bhd. (Petroliam Nasional Berhad, 63.5%; P.T. Pupuk Sriwidjaja Indonesia, 13%; Thai Ministry of Finance, 13%; Philippines National Development Co., 9.5%; Singapore Temasek Holdings Pte. Ltd., 1%)	Bintulu, Sarawak	395
Do.		PETRONAS Fertilizer Kedah Sdn. Bhd. (wholly owned subsidiary of Petroliam Nasional Berhad)	Gurun, Kedah	378
Do.		PETRONAS Ammonia Sdn Bhd. (wholly owned subsidiary of Petroliam Nasional Berhad)	Kerth, Terengganu	370
Petroleum, crude	thousand 42-gallon barrels per day	ExxonMobil Exploration and Production Malaysia, Inc.	Offshore Terengganu	390
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	100
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	184

See footnote at end of table

TABLE 2--Continued

MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum, crude--Continued:	thousand 42-gallon barrels per day	Sarawak Shell Bhd.	Offshore Sarawak	184
Do.	do.	PETRONAS Carigali Sdn. Bhd.	Offshore Terengganu	22
Do.	do.	Murphy Sarawak Oil Co. Ltd.	Offshore Sarawak	15
Tin:				
Concentrate		Delima Industries Sdn. Bhd.	Dengkil, Selangor	1.1
Do.		Maiju Sama Sdn. Bhd.	Puchong, Selangor	1.6
Do.		New Lahat Mines Sdn. Bhd.	Lahat, Perak	0.3
Do.		Omsam Telecommunication Sdn. Bhd.	Bakap and Batu Gajah, Perak	0.5
Do.		Rahman Hydraulic Tin Bhd.	Klian Intan, Perak	1.2
Do.		S.E.K. (M) Sdn. Bhd.	Kampar, Perak	0.4
Do.		Tasek Abadi Sdn Bhd.	Senudong and Kampar, Perak	0.5
Refined		Malaysia Smelting Corp. Bhd. (The Straits Trading Co. Ltd., 37.44%; Malaysia Mining Corp., 37.44%; others, 25.12%)	Butterworth, Penang	35
Titanium, dioxide		Huntsman Tioxide Sdn. Bhd. (a subsidiary of Huntsman Tioxide of the United Kingdom)	Kemaman, Terengganu	56

[1] All companies operated integrated plants. Annual capacity is for cement production; an asterisk (*) denotes the clinker capacity.

THE MINERAL INDUSTRY OF MONGOLIA

By Pui-Kwan Tse

Mongolia is a landlocked country that is bordered by China to the south and Russia to the north. It has one of the lowest population densities in the world; the population is about 2.5 million, and the total land mass is about 1.6 million square kilometers. About 30% of the total population lived in the capital city of Ulaanbaatar, another 30% resided in the Central region, and 18% of the population lived in the West region; the South and East regions were sparsely populated and accounted for the remaining 32%. Although the country continued its economic growth of the past several years, poverty remained persistent in rural and urban areas. In 2004, the country's economic growth rate was 10.6%, which was the highest rate since Mongolia's economic transition began in 1991; this growth rate was higher than the 9.5% growth rate in China. Higher mineral prices in the international markets and mild weather in 2004 had a positive impact on the growth (Mongolian News, 2005§[1]).

Ulaanbaatar was the center of the country's economic and industrial growth. About 50% of Mongolia's gross domestic product (GDP) of $1.5 billion and 30% of the country's industrial output was attributed to economic activities in Ulaanbaatar. The mineral sector contributed about 17.3% of the GDP. Mongolia's economy was expected to continue to grow in the next couple of years; future growth was contingent on weather and commodities prices. The manufacturing and mining sectors were expected to be the main contributors to this growth. The Government set the per capita income target at $716 in 2006 from $440 in 2001 (Asian Development Bank, 2004).

Since the 1990s, the Asian Development Bank and the World Bank have provided loans and assistance to the Mongolian Government to promote the development of a sound financial sector to support private-sector-led growth. The Ministry of Finance plans to submit a revised taxation law to the Parliament for approval in 2005. The amendments will change personal and corporation income taxes and value-added taxes. The revised law is intended to eliminate double taxation, to minimize the tax burden, and to reduce taxes. Corporate income tax will be reduced to one category, 25% of total income from 30% and 15% depending on earned income. The changes are based on the recommendation by the International Monetary Fund. Domestic and foreign investors are concerned that the tax reform could increase the tax burden and damage foreign investment (UB Post, 2005d§).

A group of Parliamentary representatives submitted proposed mineral law amendments to the Speaker of the Parliament. The current mineral law was adopted in 1997 and amended in 2001. The bill recommended an increase in the minerals royalty to 15% from 2.5%, a doubling of the license fee, and an added export customs tax on mining products. The bill also proposed to reduce tax incentives for mining. Under the current mineral law, companies receive 100% tax exemption for the first 5 years of operation followed by 50% in the next 5 years. The proposed bill will reduce the 100% tax exemption for the first 2 years followed by 50% in the next 3 years. The duration of exploration licenses will be changed to 2 years with a discretionary extension of 3 years with the option of a 2-year extension. The group suggested that the proposed changes would provide more opportunity to local companies without damaging the support for foreign investment (UB Post, 2005a§).

Mongolia has extensive and largely untapped mineral resources. Owing to poor infrastructure, only about 15% of the total area has been geologically mapped. In 2005, the Government planned to invest $54.5 million in infrastructure development. The mining sector was expected to play an important role in the country's future economic development. The Government adopted several long-term programs to explore for and develop metallic and nonmetallic minerals, such as coal, copper, fluorspar, gold, oil, and silver. The Government also encouraged foreign investment and participation in exploration, exploitation, and processing of minerals. Mining accounted for about 30% of the country's industrial output and 60% of its export revenue. In 2004, a total of $100 million was spent on exploration in Mongolia, mainly by the private sector (Mongolia Development Gateway, 2005d§; UB Post, 2005b§).

The country's trade has been heavily influenced by economic developments in China and Russia. In 2004, Mongolia's total trade increased by 31.6% to $1.86 billion. Because of high global metal market prices, the value of exports increased by 38.5% to $853.3 million. Owing to an increased demand for agricultural products, the value of imports increased by 26.3% to $1.01 billion. The value of metal and mineral exports and imports accounted for about 57.5% of the country's total trade value. Mongolia exported nearly all its output of copper concentrates and molybdenum concentrates to China and fluorspar was shipped to Japan and Russia. Petroleum and petroleum products remained the leading imported commodities followed by textiles and flour. Mineral exports from Mongolia were expected to increase in the next couple of years. A copper smelter and a zinc plant were scheduled to be put into operation in 2005 and 2006, respectively. China and Russia were Mongolia's two major trading partners. China accounted for 47.8% of Mongolia's total export value, and the United States 17.9%. Russia was Mongolia's leading exporter; it accounted for 33.3% of the total imported value followed by China with 25.1% (Ministry of Industry and Trade, 2005).

The leading mining operation in Mongolia, Erdenet Mining Corp., maintained its mining output of more than 25 million metric tons per year (Mt/yr) of ore and produced concentrates that contained more than 130,000 metric tons (t) of copper and 1,500 t of molybdenum. Because of the decline in the average ore grade, the output of copper and molybdenum in concentrates decreased to 130,000 t and 1,141 t, respectively. Erdenet (49% shares) and Samsung Corp. of the Republic of Korea (51% shares) formed a joint-venture to build a 25,000-metric-ton-per-year (t/yr) copper cathode plant that would use Outokumpu's solvent extraction-electrowinning technology at Erdenet. Capital investment was estimated to be $70 million. The construction of the plant began in 2004 and was scheduled to start production in 2005. Outokumpu Group of Finland signed a memorandum of understanding (MOU) with Erdenet to build a 35,000-t/yr copper rod plant; Outokumpu's HydroCopper process would be used for low-grade copper concentrates. Erdenet and Outokumpu were considering the formation of a joint-venture company (Erdenet Mining Corp, 2005§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Erdenet (30% shares) and Metal-Tech Ltd. of Israel (70% shares) established the joint-venture company Shim Technology Ltd. to build a $23.85 million molybdenum plant. The plant will produce ammonium perrhenate, molybdenum trioxide, and molybdenum products. The construction of the plant began in 2004 and was expected to be completed in 2005. Erdenet also planned to build a 50,000-t/yr copper cathode plant with Bateman Engineering Pty Ltd of Australia (Erdenet Mining Corp., 2005§).

Ivanhoe Mines Ltd. continued to work on its Oyu Tolgoi (Turquoise Hill) project at Oyu Tolgoi, Umnogovi Aimag (Umnogovi Province), in the southern Gobi. AMEC Engineering and Consulting Services of Canada estimated that the measured and indicated resources at Oyu Tolgoi were 1,060 million metric tons (Mt) at average grades of 0.47% copper and 0.36 gram per metric ton (g/t) gold based on a 0.3% copper-equivalent cutoff grade from surface to 560 meters (m) depth and a 0.6% copper-equivalent cutoff below 560 m (Mining Journal, 2004). Ivanhoe completed the feasibility study for the development of two gold-rich open pits in the southwestern and central deposits at Oyu Tolgoi and planned to develop the project in two stages. During the first stage, the company would build a 20-Mt/yr ore concentrator mill to produce 245,500 t/yr of copper in concentrates. Gold production was expected to be 12.5 t/yr. Initial capital investment was estimated to be $529 million. The mine was expected to begin production in 2007. During the second stage, the company would expand ore output capacity to 40 Mt/yr by developing the open pit and underground mine at Hugo North. The Oyu Tolgoi project was projected to have the capability to sustain ore output of 40 Mt/yr for 25 years. The company planned to build its own smelter, refinery, and powerplant (Metal Bulletin, 2005).

Ivanhoe announced that the company had discovered four significant copper-gold deposits, which are located about 140 kilometers (km) northwest of Oyu Tolgoi, in the area that was named Bronze Fox District. The Bronze Fox District comprises four auriferous porphyry targets—Bronze Fox, East Fox, West Fox, and Tourmaline Hills; these occur with a 14-km-long corridor of alteration and mineralization that is associated with monzodiorite to granodiorite intrusion. Besides copper and gold, significant amounts of arsenic and molybdenum were found (Ivanhoe Mines Ltd., 2004).

Gold mining in Mongolia increased significantly during the past decade, and the number of companies engaged in gold mining grew in the 1990s to more than 100 and produced a total of more than 12 t of gold. Because most of the companies were placer gold producers and many placer deposits were nearly depleted, gold output decreased in the early 2000s. In 2004, a number of gold mines were under development. Gold mines at Borro, Bumbat, and Olon Ovoot were put into operation. Gold output increased sharply and was expected to continue to increase in the near future. Domestic gold demand was mainly for jewelry. More than 90% of total output was exported mainly to China. Before 2002, gold producers were required to sell their output at a fixed price to the Mongol Bank, which paid the producers in foreign currency for up to 50% of gold prices. Since 2002, to encourage gold mining, the Mongol Bank started to buy gold from individual gold producers at the world market prices as for entities and companies. Recently, the Government allowed some gold producers and commercial banks to export gold. Because of climate and environment, gold excavation in Mongolia is not a year-long operation. The volume of gold sold to the Mongol Bank reached its highest level in June and fell slightly in July because of the Naadam national holiday and rose again in August. After August, the volume declined. In 2004, the Mongol Bank purchased 11.6 t of gold from local producers, and gold producers sold and exported about 7.5 t of gold directly to other buyers (Mongolia Development Gateway, 2005b§).

On March 1, the first hard-rock gold mine Boroo Gold Mine, which was operated by Boroo Gold Company, began operation. Boroo Gold was owned by AGR Ltd. of Australia (95%) and Mongolian Altai Trading Co. (5%). In March 2002, Cameco Gold Inc. (CGI) acquired a 52% interest in AGR. Under the purchase agreement, CGI would oversee the construction, and AGR would operate the mine. Boroo Gold was owned by Centerra Gold Inc. of Canada, in which Cameco retained a controlling interest. The total capital cost for the development of the mine was $75 million. The mine is located in Bayangol district, Selenge Province, about 110 km north of Ulaanbaatar. The mine had gold reserves of 44 t of gold and a mine life of 8 years. Annual gold output was about 5 t (Mongolian News, 2004§).

In 2004, Entree Gold Inc. of Canada continued exploration at the Blue Springs, the Rich Gobi, the Shivee Tolgoi (Lookout Hill), the Virgin, and the White Hills concessions. The Shivee Tolgoi encompassed a total area of 179,594 hectares and was completely surrounded by Ivanhoe's Oyu Tolgoi prospect. The Temuujin prospect was at the 216,000-hectare Virgin property in the inferred northeastern extension of the South Gobi porphyry copper-gold belt near to the Trans-Mongolia railway and China. Surface grab sampling showed up to 4.04% copper and 1.2 g/t gold from the Temuujin II area. The drilling program was expected to continue in 2005. The Blue Springs property is located in central Mongolia. Detailed geophysical surveys, mapping, and trenching have been completed. The company identified new mineralized zones on the Blue Springs property. Samplings from the central zone had average grades of 15.2 g/t gold, 68.6 g/t silver, and 1.85% copper. The company planned to continue to conduct sample analyses and geochemical and geophysical surveys of the property during 2005 (Entree Gold Inc., 2004).

Solomon Resources Ltd. announced that the company had signed an MOU with Gallant Minerals Ltd. to acquire up to an 80% interest in each of 20 gold and base-metal projects in Mongolia. Gallant owned and managed 38 exploration licenses that covered 188,000 hectares in Mongolia. Major projects included the Bayantsagaan gold project, which is located in the North Khentii gold belt 80 km northwest of Ulaanbaatar. The Nurag Uul gold project is located 100 km west of Dalandzadgad, Omnogobi Aimag, and 700 km south of Ulaanbaatar. The Zos Uul gold project is located approximately 100 km north of the Bayan Obo rare-earth mine in China and 700 km southeast of Ulaanbaatar. The Tsakhir copper-gold-molybdenum project is located 125 km from Dalandzadgad. The Toste Tl copper-gold project is located approximately 140 km north of Ejin Qi in China and 300 km southwest of Dalandzadgad (Solomon Resources Ltd., 2005).

The Government planned to privatize the state-owned Darkham Metallurgy Plant in Darkhan-Uul Aimag. The steel plant was operated under the 1994 intergovernmental agreement between Japan and Mongolia. In 2001, Mongolrostsvetmet Corp. won the management contract to run the plant. Since Mongolrostsvetmet took over the plant's management, the financial and operational conditions of the plant have improved. The plant had a crude steel annual output capacity of 100,000 t using local steel scrap. The Parliament approved the Government's increase of the export tariff on scrap iron to $297 per metric ton from $119 per ton in 2004. The increase of export duty aimed to reduce scrap iron exports to China. Owing to the shortage of raw material, the Darkhan Metallurgy Plant operated below its output capacity, which resulted in a supply shortage of steel products to the domestic construction sector. Even with an increase of tariff rate, however, the supply of scrap iron remained tight because only one out of four exports was reported to the Customs General Office (Mongolia Development Gateway, 2004a§, b§).

Mongolrostsvetmet signed an agreement with Baotou Iron and Steel Group Co. Ltd. of Nei Mongol Autonomous Region, China, to exploit an iron deposit in Bargilt. Baotou will provide $500,000 for the project, and mine construction will begin at the end of 2005. Bargilt Co. Ltd. was established to oversee the project (Mongolia Development Gateway, 2005a§).

The construction of Tsairt Minerals' Tumurtiin Ovoo Mine near the town of Sukhe Bator, Sukbataar Aimag, began in October 2003 and was scheduled to be completed in August 2005. The mine was jointly owned by China Nonferrous Metal Industry Engineering Co. Ltd. (51%) and Mentalimpex of Mongolia (49%). The mine had 7.5 Mt of ore reserves with an average grade of 13.67% zinc. The open pit mine was designed to process 300,000 t of ore and could produce 66,000 t/yr of zinc in concentrates for 14 years. The construction cost was $38 million (Mongolia Development Gateway, 2005c§).

Mongolian coal output was mainly from mines at Aduun Chuluun, Baganuur, Sharyn Gol, and Shivee-Ovoo, which accounted for 90% of total production. Coal output had declined to about 5 Mt in the past several years from its peak of 8.6 Mt in 1988. The decline was caused by inadequate processing facilities, obsolete equipment and rail haulage system, and shortage of spare parts. During the past several years, the Government invested $24 million to improve production conditions. The Government planned to privatize the Baganuur and the Shivee-Ovoo Mines (Mongolia Development Gateway, 2004c§).

Ivanhoe announced that the company had discovered high-quality coal near the Nariin Sukhait Mine in Omnogobi Aimag on the property controlled by Ivanhoe in the South Gobi Desert; the mine is located approximately 40 km north of the Mongolia-China border. The deposit contains metallurgical and thermal coals. The Nariin Sukhait Mine was operated by the Sino-Mongolia joint venture Quing-Hua Mac Co. The mine had coal reserves of 125.5 Mt and was designed to produce 5 Mt/yr of coal, of which about 450,000 t/yr was coking coal. The coking coal was shipped by truck to Jiuquan Iron and Steel Co. in Gansu Province, China. China intended to build a 400-km-long railway from Jiuquan to the Mongolian border, which is 40 km south of the Narilin Sukhait project area. The railway would raise coal shipments to Jiuquan to about 2 Mt/yr. The Nariin Sukhait Mine lies within a small mineral lease surrounded by land controlled by Ivanhoe. Energoresource and Ivanhoe discussed joint development of the site. Energoresource held the license to the Tavan Tolgoi coal deposit that is located 140 km northwest of Oyu Tolgoi. Tavan Tolgoi could supply thermal coal for Ivanhoe's powerplant for the Oyu Tolgoi project. According to earlier data from the Soviet Union, the coal seam in the Nariin Sukhait Mine was up to 60 m thick and contains low ash and sulfur (Ivanhoe Mines Ltd., 2005).

The Tavan Tolgoi deposit is located about 90 km east of Dalanzadgad and 560 km south of Ulaanbaatar. Exploration work was first conducted in the 1950s. In 1998, BHP Ltd. of Australia acquired the exploration license; because of lack of infrastructure, however, the company decided not to pursue the development of the deposit and to cancel the exploration license. After that, a Canadian company also explored the area and concluded that mining would not be economically viable. Several Chinese companies also expressed interest in developing the deposit. In 2004, several Mongolian companies established Energoresource to acquire the exploration license. Hundreds of millions of dollars were needed to develop the deposit and Energoresource was looking for foreign investors to participate in developing the coal mine. The deposit was estimated to have 5 billion metric tons of high-quality coal (UB Post, 2005c§).

Geologists had discovered that the geologic formations of the East Gobi and the Tamsag Basins in eastern Mongolia have many similarities with the Erlian and the Khailaar Basins in China. Estimation of oil resources in Mongolia ranged between 4 billion and 6 billion barrels (Gbbl). Recent studies showed that the Tamsag Basin had oil reserves of between 50 million barrels (Mbbl) and 1.5 Gbbl. SOCO International plc of the United Kingdom explored the contract block areas of XIX, XXI, and XXII in the Tamsag Basin. Dongsheng Petroleum of China and Roc Oil Co. of Australia jointly explored the contract block areas of XIII and XIV in the eastern Gobi Basin under a production-sharing contract (PSC). SOCO drilled four wells in area XIX. During the pilot production runs, wells 19-21 and 19-20 flowed at 120 barrels per day (bbl/d) and 70 bbl/d, respectively. Work on wells 19-22 and 19-23 will continue in 2005. Daqing Oil Co. (a subsidiary of China's leading oil producer PetroChina Ltd.) agreed to pay $93 million to acquire SOCO's 85% interest in the PSCs for the Tamsag

Basin, Mongolia. About $40 million will be paid in cash, and $53 million will be based on total crude oil production that will exceed 27.8 Mbbl starting on January 1, 2005. Daqing planned to drill between 8 and 12 wells in the area (Petroleum Economist, 2004, 2005).

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Major Source of Information

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Major Publications

National Statistical Office of Mongolia, Ulaanbaatar, Mongolia:
Statistical Bulletin, monthly.
Mongolian Statistical Yearbook, annual.

TABLE 1
MONGOLIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004[e]
Cement, hydraulic	thousand metric tons	92	68	148	162 [r]	170
Coal	do.	5,185	5,141	5,307	5,666 [r]	6,800 [3]
Copper:						
Mine output, Cu content		125,227	133,503	131,705	130,270	130,000 [3]
Metal, refined		641	1,476	1,500	1,341 [r]	2,300 [3]
Fluorspar:						
Acid grade	thousand metric tons	111	127	86	120 [r]	105
Submetallurgical and other grade	do.	87	72	99	150 [r]	190
Total	do.	198	199	185	270 [r]	295 [3]
Gold, mine output, Au content[4]	kilograms	11,808	13,675	12,097	11,119 [r]	18,600 [3]
Gypsum[e]	thousand metric tons	25	25	25	25	25
Lime, hydrated and quicklime	do.	37	30	42 [r]	42 [r]	40
Molybdenum, mine output, Mo content		1,335	1,514	1,590	1,793	1,141 [3]
Petroleum, crude	thousand 42-gallon barrels	65	74	139	183 [r]	190 [3]
Salt, mine output		1,293	1,800	1,268	1,971 [r]	2,000
Silver, mine output, Ag content[e, 5]	kilograms	25,000	27,200	27,000	27,000	28,000
Steel, crude		13,000	10,000	15,900	39,300 [r]	40,000
Tungsten, mine output, W content		52	63	35	40 [e]	40

[e] Estimated; estimated data are rounded to no more than three significant digits.

[1] Table includes data available through July 20, 2005.

[2] In addition to the commodities listed, crude construction materials, such as sand and gravel, and varieties of stones, such as limestone and silica, are produced, but available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Reported raw gold production but excludes gold contained in copper concentrate.

[5] Based on 55 grams of silver per metric ton of copper concentrate.

Sources: National Statistical Office of Mongolia (Ulaanbaatar). Mongolian Statistical Yearbook 1999-2003. Mineral Resources Authority of Mongolia, Mining Office, Output of Mineral Commodities (Minerals Questionnaire 1999-2002).

THE MINERAL INDUSTRY OF NEW CALEDONIA

By Travis Q. Lyday and Staff

In 2004, the mineral industry of the French territory of New Caledonia continued to be dominated by the mining of nickeliferous laterite-saprolite-limonite-garnierite ores and the production of ferronickel and a nickel-cobalt matte. New Caledonia was the world's second ranked producer of ferronickel after Japan and the fifth ranked source of nickel ore after Russia, Canada, Australia, and Indonesia (Jorgenson and others, 2005§[1]; Kuck, 2006§).

Société le Nickel (SLN), which was a consortium of the Eramet Group of France (60%), Société Territoriale Caledonian de Participation Industrielle of New Caledonia (30%), and Nisshin Steel Co. of Japan (10%), mined nickel ore from five opencut operations on La Grand Terre, which was the main island of New Caledonia. SLN operated mining centers at Kouaoua, [which was located 140 kilometers (km) north-northwest of Noumea], Nepoui-Kopeto (250 km northwest of Noumea), Thio (120 km north-northwest of Noumea), and Tiebaghi (320 km northwest of Noumea). In 2004, SLN increased the output capacity at the Tiébaghi Mine. The Société Minière Georges Montagnat ran the contract mining operations at SLN's Etoile du Nord deposit, which was located 280 km northwest of Noumea (Eramet Group, 2005, p. 2; undated c§).

With the installation of a new furnace in June 2004, SLN expanded the nominal capacity of the Doniambo Smelter at Noumea to 75,000 metric tons per year (t/yr). Prior to the expansion, the smelter had a 62,000-t/yr capacity; about 80% of the output of the smelter was ferronickel, which had an average nickel content of 26% to 32%; the remaining smelter production was a nickel-cobalt matte, which contained about 75% nickel. The matte was shipped to Eramet's Le Havre-Sandouville Refinery near La Havre, France (Eramet Group, 2005, p. 2; undated a§, b§).

Other open pit nickel mining operations in New Caledonia included mines at the Boakaine, the Kouaoua, and the Nakety mining centers, which were operated by Société Minière du Sud Pacifique S.A. (Groupe SMSP); the Karembe, the Moneo, and the Nakety mining centers, which were operated by Société des Mines de la Tontouta (SMT); and the Nakety-Bogota mining center, which was operated by Gemini S.A. for SMT. Output from these mines was exported.

In October 2004, Canada's Inco Ltd. announced its decision to develop the Goro nickel-cobalt deposit at the southern tip of La Grand Terre. The operating company, Goro Nickel S.A., expected that production from the Goro Mine would begin in September 2007. The mine was to be designed to produce 60,000 t/yr of nickel and about 5,000 t/yr of cobalt at full capacity. In 2004, Inco held 85% equity interest in Goro Nickel and the Bureau de Recherches Géologiques et Minières (B.R.G.M.) of France held the remaining 15%; negotiations on restructuring Goro Nickel's ownership were underway, however, with the Société de Participation Minière du Sud Caledonien S.A.S., which was a company formed by the three Provinces of New Caledonia, and Sumic Nickel Netherlands (a joint venture of Mitsui & Co., Ltd. and Sumitomo Metal Mining Co., Ltd. of Japan) (Inco Ltd., 2004).

In addition to producing abundant resources of nickel ore, the island territory also produced construction materials from several quarries, and Société des Ciments de Numbo operated a cement plant at Noumea. More-extensive coverage of the mineral industry of New Caledonia can be found in the 2003 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Asia and the Pacific.

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Major Source of Information

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[1] References that include a section mark (§) are found in the Internet References Cited section.

TABLE 1
NEW CALEDONIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004
Cement		90,750 r	92,868	100,080	100,171 r	114,762 p
Cobalt, mine output:e						
Co content		1,700 r	1,600 r	1,400 r	1,400 r	1,500
Recovered		330 r	310 r	280 r	270 r	300
Nickel:						
Ore:						
Gross weight	thousand metric tons	7,398 r	7,220 r	5,944 r	6,625 r	6,980 p
Ni content		126,041 r	117,734 r	99,841 r	112,013 r	118,279 p
Metallurgical products:						
Ferronickel:						
Gross weight		146,000 e	153,012 r	162,973 r	167,208 r	143,000 e
Metal content (nickel plus cobalt)		43,914	45,912	48,650	50,666 r	43,016
Nickel matte:						
Gross weight		18,700 r, e	17,586 r	15,583 r	15,309 r	16,800 e
Metal content (nickel plus cobalt)		13,549	13,061	11,217	10,857 r	12,164

[e] Estimated; estimated data are rounded to no more than three significant digits. [p] Preliminary. [r] Revised.

[1] Table includes data available through October 2005.

[2] In addition to the commodities listed, crude (unspecified) and crushed stone, construction sand, and silica sand for metallurgical use are produced, but data are insufficient to make reliable estimates of quantities.

THE MINERAL INDUSTRY OF NEW ZEALAND

By Travis Q. Lyday and Staff

Owing to its diverse geology and dynamic tectonic history, New Zealand's economic minerals include coal, industrial and metallic minerals, natural gas, and petroleum. Although gold and silver continued to dominate the metal mining sector in 2004, coal mining and the production of a wide assortment of industrial minerals, which ranged from bentonite to zeolite, were prominent and important for New Zealand's economy. The mining industry also contributed to other sectors of the economy, such as agriculture (fertilizer), primary industry (coal and ironsand), manufacturing (industrial minerals), and transportation (road aggregate). The Ministry of Economic Development (2005a§[1]) reported that the value of mining industry production in 2004 was about $757 million, of which industrial mineral production was valued at $316 million; coal production, about $273 million; gold, about $134 million; and ironsand (magnetite), $6 million.

According to the International Monetary Fund (2005§), New Zealand's gross domestic product (GDP) based on purchasing power parity was estimated to be about $97 billion in 2004. The GDP per capita based on purchasing power parity was calculated to be $23,944.

In addition to the numerous coal, gold placer, and industrial minerals operations, several oilfields, and a few gold-silver mines, New Zealand had three large downstream processing plants. New Zealand Aluminum Smelters Ltd. operated the 333,000-metric-ton (t)-per-year-capacity Tiwai Point Smelter at Bluff near Invercargill on South Island. The alumina used to produce the aluminum at Tiwai Point was imported from the Comalco Group's alumina refineries in Australia. New Zealand Steel Ltd. (NZ Steel) operated the Glenbrook steel mill, which was located south of Aukland. The iron used by NZ Steel was in the form of titanomagnetite-rich sand derived from the coastal erosion of the Mount Taranaki volcanics. Two such ironsand mines are located in New Zealand—Taharoa and Waikato North Head. NZ Steel mined at both sites, but only the Waikato North Head material was used for the Glenbrook steelworks; the Taharoa ironsand was exported to Chinese and Japanese steel mills. The New Zealand Refining Co. Ltd. operated the 39-million-barrel-per-year-capacity Marsden Point Refinery near Whangarei, which processed about 40% of New Zealand's crude oil production (Ministry of Economic Development 2005b§; Comalco Group, undated§).

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Major Source of Information

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[1] References that include a section mark (§) are found in the Internet References Cited section.

TABLE 1
NEW ZEALAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001[e]	2002	2003[e]	2004[p]
METALS						
Aluminum metal, smelter:						
Primary		328,400	322,300 [2]	333,900	334,400 [2]	350,400
Secondary		21,500	21,500	21,500	21,500	21,500
Total		350,000 [r, e]	343,800 [2]	355,400	355,900 [2]	371,900
Gold, mine output, Au content	kilograms	9,880	9,885 [2]	9,770 [e]	9,300 [r]	10,151
Iron and steel:						
Iron sand, titaniferous magnetite, gross weight	thousand metric tons	2,692	1,636 [2]	1,740	1,947 [2]	2,329
Pig iron[e]	do.	600	600	600	600	650
Steel, crude[e]	do.	765 [2]	770 [2]	750	800	850
Lead, refinery output, secondary[e]		10,000	10,000	10,000	10,000	10,000
Silver, mine output, Ag content	kilograms	22,886	27,120 [2]	28,720	29,920 [r, 2]	30,084
INDUSTRIAL MINERALS						
Cement, hydraulic[e]	thousand metric tons	950	950	950	950	1,000
Clays:						
Bentonite		9,800	10,000	7,800	10,940 [2]	10,050
Kaolin, pottery		16,300	15,000	17,200	14,770 [r, 2]	15,240
For brick and tile		69,800	70,000	47,500	56,550 [2]	57,350
Diatomaceous earth		15	15	20	320 [2]	240
Lime[e]		20,000	20,000	20,000	20,000	20,000
Marble[e]		15,000	15,000	15,000	15,000	15,000
Nitrogen, N content of ammonia		105,300	116,900 [2]	109,200	110,000	110,000 [e]
Perlite[3]		2,200	2,200	7,050	5,000 [2]	5,600
Pumice		68,000	68,000	203,700	173,400 [2]	280,950
Salt[e]		60,000	70,000 [2]	70,000	70,000	70,000
Sand and gravel:						
Silica sand, glass sand		47,400	47,500	60,150	48,400 [2]	60,080
Other industrial sand		660,300	660,000	575,700	2,207,190 [r, 2]	1,753,140
For roads and ballast	thousand metric tons	18,336	18,000	18,522	18,500	19,500 [e]
For building aggregate	do.	7,499	7,500	8,026	9,267 [r, 2]	11,362
Stone:						
Dolomite		47,800	47,500	24,720 [r]	21,920 [2]	12,000
Limestone and marl:						
For agriculture	thousand metric tons	2,029	2,000	2,472 [r]	2,557 [r, 2]	1,913
For cement	do.	1,603	1,600	1,697	1,652 [2]	1,839
For other industrial uses	do.	527	500	865	731 [r, 2]	561
For roads[e, 4]	do.	20,000	20,000	20,000	20,520 [2]	20,600
Serpentine		51,500	51,500	61,300	68,960 [2]	60,880 [2]
Dimension		28,700	29,000	30,200	37,300 [2]	26,110
Rock for harbor work[e]	thousand metric tons	1,500	1,500	1,500	1,500	2,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon dioxide, liquefied[e]		10,000	10,000	10,000	10,000	10,000
Coal, all grades	thousand metric tons	3,586	3,911 [2]	4,459	5,180 [2]	5,154
Gas:[e]						
Manufactured, from gasworks	thousand cubic meters	11,000	11,000	11,000	11,000	11,000
Natural:						
Gross production	million cubic meters	5,700	5,750	5,780	5,800	5,800
Marketed production	do.	4,100	4,500	5,000	5,000	5,000
Natural gas liquids:[e]						
Liquefied petroleum gas	thousand 42-gallon barrels	2,000	2,000	2,100	2,200	2,200
Natural gasoline	do.	700	700	750	800	800
Total	do.	2,700	2,700	2,850	3,000 [r]	3,000
Peat	cubic meters	97,200	95,000	90,000	90,000	90,000

See footnotes at end of table.

TABLE 1--Continued
NEW ZEALAND: PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		2000	2001[e]	2002	2003[e]	2004[p]
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:[e]						
Crude	thousand 42-gallon barrels	13,160 [2]	12,400	11,700	8,711 [2]	8,711
Refinery products:						
Gasoline	do.	8,500	9,000	9,000	9,000	9,000
Distillate fuel oil	do.	13,000	14,000	14,000	14,000	14,000
Residual fuel oil	do.	3,500	4,000	4,000	4,000	4,000
Other	do.	3,500	4,000	4,000	4,000	4,000
Refinery fuel and losses	do.	2,000	3,000	3,000	3,000	3,000
Total	do.	30,500	34,000	34,000	34,000	34,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p] Preliminary. [r] Revised.

[1] Table includes data available through November 15, 2005.

[2] Reported figure.

[3] Includes zeolite.

[4] Includes dolomite.

THE MINERAL INDUSTRY OF PAKISTAN

By Travis Q. Lyday

The Islamic Republic of Pakistan is located in southern Asia in the northwestern corner of the Indian subcontinent. It borders the countries of India to the east, China to the northeast, Afghanistan to the north and west, and Iran to the southwest. Pakistan's capital city is Islamabad, which is located in the Islamabad Capital Territory. Other major cities are Faisalabad, Hyderabad, Karachi, and Lahore. The southern portion of the country forms a 1,046-kilometer (km) coastline alongside the Arabian Sea. Pakistan's total area is 803,940 square kilometers (km^2), which is slightly less than twice the size of California. Its land area is 778,720 km^2 and its water area is 25,220 km^2 (U.S. Central Intelligence Agency, 2005§[1]).

In 2004, Pakistan's gross domestic product (GDP) based on purchasing power parity was $360.8 billion. The per capita GDP based on purchasing power parity was about $2,404. The country's GDP real annual growth rate was 6.5% (International Monetary Fund, 2005§).

Environmental Issues

To increase the living standards of its citizens, the Pakistani Government has largely given economic development precedence over environmental issues. Unchecked use of hazardous chemicals, vehicle emissions, and industrial activity has contributed to a number of environmental and health hazards, the chief of which is water pollution. Much of the country lacks potable water owing to industrial waste and agricultural runoff that has contaminated drinking water supplies. The widespread use of low-quality fuel combined with a substantial increase in the number of vehicles on Pakistani roads has led to significant air pollution problems (U.S. Energy Information Administration, 2005§).

Structure of the Mineral Industry

Pakistan's mining and quarrying sector, which included petroleum and natural gas, played a minor role in the country's economy; these mineral fuels accounted for only between 0.5% and 1.0% of the country's GDP (Ministry of Industries and Production, 2004). The major mined products included a variety of minerals, of which the more important were antimony, barite, china clay, chromite, coal, dolomite, fire clay, fluorite, fuller's earth, natural gas, gemstones, granite, gypsum, iron ore, limestone, magnesite, marble, crude oil, onyx, phosphate rock, pumice, quartzite, soapstone, salt, silica sand, and silver.

Pakistan has extensive energy resources, which include natural gas, coal, and crude petroleum, and it has a large potential for further development of hydroelectric power. Exploitation of energy resources, however, has been slow owing to a shortage of capital and to domestic and international political constraints. Pakistan produced 61,000 barrels per day (bbl/d) of crude petroleum in 2004 and has plans to increase its output to 100,000 bbl/d by 2010. Although the country is unlikely to reach self sufficiency, the Government encouraged private firms, which included foreign firms, to develop domestic production capacity. Pakistan Petroleum Ltd. (PPL) expanded its interests in 2004 by drilling offshore at the Pasni Field. This was the first time that a Pakistani oil company had explored offshore (U.S. Energy Information Administration, 2005§). PPL was incorporated in 1950 with the main objective of conducting exploration, development, and production of Pakistan's oil and natural gas resources. PPL had inherited all the assets and liabilities of the Burmah Oil Co. (Pakistan Concessions) Ltd. and commenced business in 1952. The company is listed on all three stock exchanges of Pakistan. Natural gas supplied 49% of Pakistan's energy needs in 2004; crude oil, 30%; hydroelectric energy, 13%; coal, 7%; and nuclear energy, 1% (U.S. Energy Information Administration, 2005§).

The transportation infrastructure of Pakistan was moderately developed. Of the 257,683 km of roads, 152,033 km—including 339 km of expressways—was paved, and 105,650 km was unpaved. Pakistan has no inland waterways. The public sector railway system consisted of 7,718 km of broad-gauge 1.67-meter (m) track, of which 293 was electrified, and 445 km of narrow-gauge (1.000-m) track. Of the 131 airports, 92 had permanent-surface runways. International shipping ports included Karachi and Port Muhammad bin Qasim. The merchant marine fleet of 13 ships included three petroleum tankers. Pipelines included 9,945 km for natural gas and 1,821 km for crude petroleum (U.S. Central Intelligence Agency, 2005§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

TABLE 1
PAKISTAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[e]
METALS						
Aluminum, bauxite, gross weight[e]		8,668 [2]	9,000	9,500	9,600	4,847 [2]
Chromium ore:[e]						
Gross weight		26,844 [2]	26,000	27,200	27,500	32,401 [2]
Cr_2O_3 content		12,080 [2]	12,000	12,500	13,000	17,900
Iron and steel:[e]						
Pig iron	thousand metric tons	1,500	1,500	1,600	1,600	1,700
Steel, crude	do.	500	500	550	550	600
Lead, refined, secondary		2,000	2,000	2,100	2,330	3,000 [2]
INDUSTRIAL MINERALS						
Abrasives, natural, emery[e]		120	150	150	150	150
Barite[e]		21,234 [2]	25,000	26,100	27,100	44,071 [2]
Cement, hydraulic[e]	thousand metric tons	9,900	9,900	10,300	10,300	10,400
Chalk[e]		7,711 [2]	7,700	8,000	8,000	9,975 [2]
Clays:[e]						
Bentonite		27,700	28,000	29,200	30,000	19,150 [2]
Fire clay		143,643 [2]	145,000	151,500 [2]	160,000	201,572 [2]
Fuller's earth		15,288 [2]	15,000	15,700	16,000	17,023 [2]
Kaolin, china clay		49,574 [2]	50,000	52,000	52,000	52,363 [2]
Other		200,000	200,000	209,000	210,000	210,000
Feldspar		43,186 [2]	45,000	47,000	47,000	26,265 [2]
Fluorspar		997 [2]	1,000	1,000	1,000	1,026 [2]
Gypsum, crude		377,000 [2]	380,000	397,000	397,000	434,981 [2]
Magnesite, crude		4,192 [2]	4,200	4,400	4,500	5,042 [2]
Nitrogen, N content of ammonia[e]		1,884,300 [2]	1,966,100 [2]	2,050,000	2,050,000	2,050,000
Phosphate rock:[e]						
Gross weight		11,000	11,000	11,500	11,500	11,500
P_2O_5 content		2,000	2,000	2,100	2,000	2,000
Pigments, mineral, natural, ocher		4,747 [2]	4,800	5,000	5,000	5,000
Salt:						
Rock[e]	thousand metric tons	1,313 [2]	1,500	1,600	1,700	1,700
Marine	do.	20	20	21	23	-- [2]
Total	do.	1,333 [2]	1,520 [2]	1,621 [2]	1,723 [2]	1,700 [2]
Sand:[e]						
Bajir and common		212,120 [2]	215,000	225,000	225,000	225,000
Glass		162,000 [2]	165,000	172,000	175,000	175,000
Sodium compounds, n.e.s.:[e]						
Caustic soda		220,000	220,000	230,000	230,000	230,000
Soda ash, manufactured		230,000	230,000	240,000	240,000	240,000
Stone:						
Aragonite and marble		582,000	585,000	611,000	610,000	1,050,664 [2]
Dolomite		287,962	290,000	303,000	303,000	208,000 [2]
Limestone	thousand metric tons	9,884 [2]	9,900	10,300	12,000	12,000
Other, as "ordinary stone"[e]	do.	20	20	21	22	22
Strontium minerals, celestite		1,918 [2]	2,000	3,000	3,000	558 [2]
Sulfur:						
Native[e]		150	200	210	215	250
Byproduct, all sources		20,189 [2]	21,000	21,900	22,000	22,000 [2]
Total		20,339 [2]	21,200 [2]	22,110 [r, 2]	22,215 [2]	22,250 [2]
Talc and related materials, soapstone		54,365 [2]	55,000	57,500	58,000	57,413

See footnotes at end of table.

TABLE 1--Continued
PAKISTAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004[e]
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades[e]	thousand metric tons	3,116 [2]	3,500	3,700	3,800	3,275 [2]
Coke[e]	do.	900	900	950	1,000	1,000
Gas, natural:[e]						
Gross production	million cubic meters	24,222 [2]	25,000	26,000	26,000	30,000
Marketed production, sales	do.	20,900	21,000	22,000	22,000	27,000
Natural gas liquids[e]	thousand 42-gallon barrels	600	600	650	650	650
Petroleum:						
Crude[e]	do.	20,450 [2]	22,000	23,000	24,000	22,625 [2]
Refinery products:[e]						
Gasoline	do.	8,500	8,700	9,000	9,000	9,500
Jet fuel	do.	5,500	5,700	6,000	6,000	7,000
Kerosene	do.	2,700	3,000	3,100	3,100	3,200
Distillate fuel oil	do.	14,000	15,000	15,700	15,700	17,000
Residual fuel oil	do.	13,500	15,000	15,500	15,500	16,000
Lubricants	do.	1,500	2,000	2,100	2,100	2,200
Other	do.	5,000	7,000	7,300	7,300	7,400
Total	do.	50,700	56,400	58,700	58,700	62,300

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. --Zero.

[1] Table includes data available through November 8, 2005.

[2] Reported figure.

THE MINERAL INDUSTRY OF PAPUA NEW GUINEA

By Travis Q. Lyday

Papua New Guinea comprises the eastern one-half of the island of New Guinea (which is the second largest island in the world), an archipelago of an additional three islands (Bougainville, New Britain, and New Ireland), and about 600 smaller islets, atolls, and coral reefs. The 463,000-square-kilometer (km^2) nation, which includes 9,980 km^2 of territorial waters, is located east of Indonesia between the Coral Sea and the South Pacific Ocean and lies just north of the Australian continent.

According to the International Monetary Fund (2005§[1]), Papua New Guinea's gross domestic product (GDP) based on purchasing power parity was estimated to be about $13.6 billion in 2004, and the GDP per capita based on purchasing power parity was calculated to be $2,357. Historically, mining has played a prominent role in Papua New Guinea's economy. The first significant discovery of gold was made in 1888. Oil was discovered in 1922.

More-extensive coverage of the mineral industry of Papua New Guinea can be found in the 2002 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Asia and the Pacific.

Internet Reference Cited

International Monetary Fund, 2005 (September), Papua New Guinea, World Economic Outlook Database, accessed February 15, 2006, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

TABLE 1
PAPUA NEW GUINEA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2000	2001	2002	2003[e]	2004[e]
Copper, mine output, Cu content	metric tons	203,061	203,762	204,000	205,500 [r, 3]	177,200 [3]
Gas, natural	million cubic meters	1,438	1,434	1,450 [e]	1,450	1,450
Gold, mine output, Au content	kilograms	74,540	67,043	70,000	58,000 [r]	67,000
Natural gas liquids	42-gallon barrels	224,857	186,190	200,000 [e]	200,000	200,000
Petroleum, crude	thousand 42-gallon barrels	24,967	20,423	20,000 [e]	20,000	20,000
Silver, mine output, Ag content	kilograms	79,197	69,368	73,000	38,000 [r]	51,000

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised.

[1] Includes data available through November 1, 2005.

[2] In addition to the commodities listed, cement and crude construction materials (common clays, sand and gravel, and stone) are produced, but available general information is inadequate to make reliable estimates.

[3] Reported figure.

THE MINERAL INDUSTRY OF THE PHILIPPINES

By Travis Q. Lyday and Staff

The Republic of the Philippines, which is a developing democratic republic, is located just north of the equator about 1,100 kilometers (km) east of the coast of the mainland of Southeast Asia. The country is an archipelago that comprises 7,000 islands, of which fewer than 900 are inhabited by the country's 85 million people; the major islands are Luzon in the north, Visayas in the middle, and Mindanao in the south. In 2004, according to the International Monetary Fund (2005§[1]), the gross domestic product (GDP) of the Philippines based on purchasing power parity was estimated to be about $383 billion, and the GDP per capita based on purchasing power parity was $4,561.

The archipelago is within the Pacific "Rim of Fire," which is so-called because of the intense volcanic activity at the margins of the tectonic plates, and is well-known for epithermal gold, porphyry copper-gold, and volcanic-hosted massive sulfide deposits. In the recent past, the Philippines had been a significant producer of chromite, copper, gold, and nickel. In 2004, other important mineral commodities produced included coal, silver, and sulfur.

More-extensive coverage of the mineral industry of the Philippines can be found in the 2002 U.S. Geological Survey Minerals Yearbook, volume III, Area reports—International—Asia and the Pacific.

Internet Reference Cited

International Monetary Fund, 2005 (September), Philippines, World Economic Outlook Database, accessed February 15, 2006, via URL http://www.imf.org/external/pubs/ft/weo/2005/02/data/index.htm.

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[1] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

TABLE 1
PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001[e]	2002[e]	2003[e]	2004[e]
METALS						
Chromium, chromite, gross weight		861	1,932 [3]	2,000	2,600	2,500
Copper:						
Mine output, Cu content		129,768	20,322 [3]	18,364 [3]	20,414 [3]	15,984 [3]
Metal:						
Smelter		160,000	216,634 [3]	137,800 [3]	111,600 [3]	108,000 [3]
Refined		150,000	164,530 [3]	144,315 [3]	171,152 [3]	174,628 [3]
Gold, mine output, Au content	kilograms	36,540	33,840 [3]	35,850 [3]	37,844 [r, 3]	35,464 [3]
Iron and steel, steel, crude[e]	thousand metric tons	530	530 [3]	530	550	550
Lead, metal, secondary refined[e]		16,218 [3]	24,000	24,000	24,000	25,000
Nickel, mine output, Ni content		17,388	23,100 [3]	24,148 [3]	19,537 [r, 3]	16,973 [3]
Silver, mine output, Ag content	kilograms	23,534	33,600	8,800	9,533 [r, 3]	9,315 [3]
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	11,959	8,653 [3]	9,000	8,500	8,500
Clays:						
Bentonite		2,800	5,128 [3]	5,500	5,500	5,500
Red		-- [e]	4,983 [3]	5,000	5,000	5,000
White		1,598	5,111 [3]	5,000	5,000	5,000
Other[e]		771 [3]	800	800	800	800
Feldspar		3,440	33,122 [3]	30,000	30,000	30,000
Lime[e]		9,000 [3]	9,000	9,000	9,000	9,000
Perlite[e]		5,650 [3]	6,000	6,000	6,000	6,000
Phosphate rock	thousand metric tons	434,000	450,000	400,000	400,000	400,000
Pyrite and pyrrhotite, including cuprous, gross weight[e]		300,000	300,000	300,000	300,000	300,000

See footnotes at end of table.

TABLE 1--Continued

PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001[e]	2002[e]	2003[e]	2004[e]
INDUSTRIAL MINERALS--Continued						
Salt, marine		589,528	600,000	600,000	429,160 [3]	430,000
Sand and gravel:						
Silica sand	thousand metric tons	170 [r]	170 [r]	170 [r]	170 [r]	170
Other[e, 4]	thousand cubic meters	15,000	15,000	15,000	15,000	15,000
Stone:[e]						
Dolomite		823,302 [3]	802,189 [3]	800,000	750,000	750,000
Limestone[5]	thousand metric tons	22,244 [3]	23,000	20,000	16,432 [3]	16,000
Marble, dimension, unfinished	cubic meters	14,804 [3]	15,000	15,000	15,000	15,000
Volcanic cinder	do.	2,000	2,000	2,000	2,000	2,000
Tuff		1,662 [3]	1,500	1,500	1,500	1,500
Quartz		50,000	50,000	50,000	50,000	50,000
Crushed, broken, other[6]	thousand cubic meters	2,684 [3]	2,500	2,500	2,500	2,500
Sulfur, all forms[e]		134,000 [3]	170,000	180,000	180,000	180,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand metric tons	1,218	1,230 [3]	1,665 [3]	2,029 [3]	2,000
Petroleum:						
Crude	thousand 42-gallon barrels	400 [e]	475 [3]	2,020 [3]	2,000	2,000
Refinery products:[e]						
Liquefied petroleum gas	do.	5,500	6,000	25,200	25,200	25,200
Gasoline	do.	18,500	19,000	79,800	79,800	80,800
Jet fuel	do.	6,500	7,000	29,400	29,400	30,400
Kerosene	do.	4,500	5,000	21,000	21,000	20,000
Distillate fuel oil	do.	40,000	40,000	168,000	168,000	170,000
Residual fuel oil	do.	47,000	47,000	215,000	215,000	215,000
Refinery fuel and losses	do.	5,000	5,000	230,000	230,000	230,000
Other	do.	10,000	10,000	225,000	225,000	225,000
Total	do.	137,000	139,000	993,000 [r]	993,000	996,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Table includes data available through December 2005.

[2] In addition to the commodities listed, the Philippines produced platinum-group metals as byproducts of other metal production, but output was not reported quantitatively and no basis is available to make reliable estimates.

[3] Reported.

[4] Included "pebbles" and "soil" not further described.

[5] Excluded limestone for road construction.

[6] Included materials described as rock, crushed or broken; stones, cobbles, and boulders; rock aggregates; and broken adobe.

THE MINERAL INDUSTRY OF SRI LANKA

By Chin S. Kuo

A widespread drought hurt Sri Lanka's agricultural production and affected its power supply. However, the country's economy enjoyed a moderate growth of 5.2% in the gross domestic product (GDP) in 2004. Its per capita GDP based on purchasing power parity increased to $3,882 from $3,646 in 2003. Inflation rose to 7.6% from 6.3%. International donors (chiefly the Asian Development Bank, Japan, and the World Bank) pledged $4.5 billion in aid within a 4-year period to rehabilitate and develop the economy provided the Government reached a peace accord with the rebels. The Government announced a fertilizer subsidy of $10.5 million[1] to aid the farmers (International Monetary Fund, 2005§[2]).

Sri Lanka is endowed mostly with industrial minerals. These minerals were mined in quarries and surficial pits except graphite, which was mined underground. Graphite and mineral sands operations were export-oriented and state-owned. The Government also owned an apatite mine. Lanka Phosphate Ltd. mined the apatite deposit at Eppawala in the District of Anuradhapura in North Central Province. Graphite with a high carbon content of 99% was produced from two mechanized mines at Bogala and Kahatagaha.

Lanka Mineral Sands Ltd. exploited the Pulmoddai beach mineral sand deposit, which was rich in heavy minerals (mainly ilmenite) and contained 5 million metric tons (Mt) of ore, until 1997. The processing plant near Dambulla was scheduled to resume operations in the last quarter of 2004 after a 16-year closure. Trial production began on September 1. Production capacities at the re-commissioning were 50,000 metric tons per year (t/yr) of ilmenite and 3,000 t/yr of rutile. About 70,000 t/yr of crude zircon was planned for export. The Port of Pulmoddai could be used between April and October. The main customers for ilmenite were ACI of the United States, Currumbin Minerals Ltd. of Australia, Derby & Co. of the United Kingdom, India Rare Earth's Ltd. of India, and Ishihara Sangyo Kaisha Ltd. of Japan (Industrial Minerals, 2004).

A 50% owned subsidiary of WGI Heavy Minerals, Incorporated of the United States in Sri Lanka received a 10-year mining lease on a mineral deposit at Hambantona. The company's drilling program showed strong evidence of a commercial deposit of garnet, ilmenite, and rutile that contained significant quantities of titanium dioxide. An independent technical report was planned for the first quarter of 2005. The company was a fully integrated miner, producer, and marketer of industrial-grade minerals (WGI Heavy Minerals, Incorporated, 2004).

Lanka Ceramic Ltd. produced significant amounts of ball clay, feldspar, and kaolin. The best ball clay occurs at Dediyawala in the Kalutara District and was used intensively in the ceramic industry. Several economic deposits of kaolin are located at Boralesgamuwa and Meetiyagoda where Lanka Ceramic had refineries. Refined high-grade kaolin was used for the manufacture of porcelain ware that was intended for export. Any raw or processed materials of ball clay and kaolin were not allowed to be exported. Feldspar occurs mainly at Elehera, Haputale, Kaikawaa, Koslanda, Namal Oya, and Timbolketiya. Feldspar was primarily used in the ceramic and glass industries (Geological Survey and Mines Bureau, 2002).

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Lanka Ceramic Ltd.
Colombo, Sri Lanka
State Gem Corp.
Colombo, Sri Lanka
State Mining and Mineral Development Corp.
Colombo, Sri Lanka

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[1] Where necessary, values have converted from Sri Lankan rupees (Rs) to U.S. dollars (US$) at the rate of Rs95=US$1.00 for 2004.

[2] A reference that includes a section mark (§) is found in the Internet Reference Cited section.

TABLE 1
SRI LANKA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004[e]
Cement, hydraulic	thousand metric tons	1,008	1,108	1,018	1,164	1,400
Clays:						
Ball clay		27,525	24,846	28,431	33,405	34,000
Kaolin		12,230	9,403	8,613	9,073	9,200
Brick and tile clay[e]		8,100	8,000	8,000	8,000	8,000
Clays for cement manufacture[e]		800	850	850	900	900
Feldspar, crude and ground		28,638	27,438	28,866	32,586	33,000
Gemstones, precious and semiprecious,						
other than diamond, value	thousands	$71,774	$57,530	$54,604	$96,797	$99,000
Cats eye	carats	48,000	NA	36,891	45,228	46,000
Ruby	do.	15,800	NA	23,000	12,934	15,000
Star ruby	do.	5,400	NA	NA	NA	NA
Sapphire	do.	173,700	NA	344,900	773,547	780,000
Star sapphire	do.	280,500	NA	NA	NA	NA
Other	do.	6,426,300	NA	4,110,400	1,828,400	1,900,000
Graphite, all grades		5,902	6,585	3,619	3,387	3,400
Iron and steel, metal, semimanufactures[e]		54,000	51,000	50,000	50,000	50,000
Mica, scrap		1,491	1,161	1,161	1,674[r]	1,700
Petroleum refinery products:[e]						
Gasoline	thousand 42-gallon barrels	2,000	2,000	2,100	2,100	2,100
Jet fuel	do.	550	600	600	650	650
Kerosene	do.	1,550	1,500	1,500	1,500	1,500
Distillate fuel oil	do.	4,700	4,800	4,900	5,000	5,100
Residual fuel oil	do.	5,300	5,200	5,200	5,200	5,100
Refinery fuel and losses	do.	700	680	700	710	720
Other	do.	1,950	2,000	2,000	2,050	2,100
Total	do.	16,800	16,800	17,000	17,200	17,300
Phosphate rock, gross weight		34,443	35,440	38,775	41,357	42,000
Salt		70,107	130,272	73,274	78,713	79,000
Stone:						
Limestone	thousand metric tons	682	819	848	991	1,000
Quartz, massive		13,236	15,731	7,857	18,139	20,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. NA Not available.

[1] Table includes data available through October 6, 2005.

[2] In addition to the commodities listed, crude construction materials, such as sand and gravel, and varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

THE MINERAL INDUSTRY OF TAIWAN

By Pui-Kwan Tse

Taiwan is an island that is located south of Japan and east of mainland China in the Pacific Ocean. In 2004, Taiwan's economy grew by 5.7%, which was the largest increase since 2000. After reaching a peak of 7.9% in the second quarter, the economy slowed to 3.3% in the fourth quarter because of higher global oil prices and the deceleration of export growth during the second half of the year. The economic growth was generated by private consumption and investment. Private consumption increased by 3.1% and private investment rose by 28.2% compared with that of the previous year. The recovery of the information and communication technologies industry was the main reason for the increased business investment. In 2004, Government fixed investment decreased by 4.2% because of higher prices on construction materials and because some construction projects were postponed. The island's gross domestic product (GDP) increased to $305.4 billion and the per capita income of the island's 22.6 million people increased to $13,529 (Department of Statistics, 2005).

Because it has limited mineral resources, Taiwan imported various minerals to meet its increasing demand. In 2004, the production index for the mining sector decreased by 4.42% compared with that of 2003. Mining accounted for only 0.1% of the total industrial production output value. The manufacturing output value of fuels, industrial minerals, and metals accounted for 22.0% of the total output value. Domestic fuel supplies accounted for 1.54% of the island's total fuels demand. Iron and steel was the leading metal production sector on the island. The production of other value-added manufacturing products, such as those made of aluminum and copper, depended upon imported metals and scrap (Ministry of Economic Affairs, 2005a§,[1] b§).

Before 2004, the Taiwan authorities' development policy was centered on the manufacturing sector. Since the late 1980s, however, Taiwan's manufacturing sector has relocated most of its production base to China, which has affected Taiwan's industry structure. The service sector now accounts for a large share of the GDP, although during the recent economic recovery, real output growth of the industrial sector still outpaced that of the service sector.

In 2004, Taiwan's Council for Economic Planning and Development (CEPD) developed guidelines and action plans to promote the knowledge-intensive service sector as the new catalyst for economic growth in the next decade despite fierce global competition. The Taiwan authorities believed that high levels of service sector development would add value to products in the agricultural and manufacturing sectors, improve Taiwan's core competitive edge, and strengthen the industrial sector. The improvement of service would encourage Taiwanese businesses to stay in Taiwan and would attract foreign businesses to set up global logistics centers in Taiwan. Developing service industries such as entertainment, environmental protection, medicine and healthcare, and tourism and sports recreation would enhance the quality of life in Taiwan. The CEPD projected that the service sector would grow 6.1% per year through 2008 and that the percentage of the GDP generated by the service sector would increase to 67% in 2008 from 63.5% in 2003 (Taiwan Headlines, 2004b§; 2005d§).

The Taiwan authorities carried out the second phase of Taiwan's financial reform program in 2004. The number of state-owned banks (banks in which the government held 30% or more interest) would be reduced to 6 from 12 at yearend 2005. At least three of the domestic banks would each have more than 10% market share. The number of financial holding companies would also be reduced to 7 from 12 by yearend 2006. The ultimate goal was to build Taiwan into a regional financial service center in the Asia and the Pacific region. The Taiwan authorities will provide tax and business incentives to encourage mergers and acquisitions among financial institutions. Financial holding companies with more than 10% domestic market share will be allowed to set up branches abroad. Poorly performing banks will be encouraged to seek merger with more-competitive financial institutions. The government's share of Taiwan Cooperative Bank will be reduced to 47.53% from 60% in April 2005, and the state-owned Bank of Taiwan and Land Bank of Taiwan planned to issue shares of stock to the public. All three of the banks were also considering merger with other financial institutions. About 46% of the government's share of the Bank of Overseas Chinese was sold to a private financial institution (Polaris Securities Group), and Chang Hwa Bank planned to sell 37.28% of its shares to foreign investors. The Fair Trade Commission of the Executive Yuan approved General Electric Capital Taiwan Holding Co.'s (a subsidiary of General Electric Co. of the United States) application to acquire 40% to 49% of Cosmos Bank (China Post, 2005b§; Taiwan Headlines, 2005c§).

Taiwan was not a signatory to the Kyoto Protocol. The Ministry of Economic Affairs (MOEA), however, planned to announce limits on greenhouse gas emissions for various industrial sectors that will be within the guidelines of international standards. Taiwan ranked 22d on the list of the world's highest carbon-dioxide-producing areas and accounted for 1% of annual industrial emissions worldwide. Taiwan's Environmental Protection Administration and Taiwan Semiconductor Industry Association (TSIA) signed an agreement that members of TSIA would voluntarily reduce perfluorocarbon emissions to the average standard set from 1997 to 1998 by 2010. Officials of MOEA also urged Taiwan's chemical companies to take early action to address the new international environmental protection requirements; otherwise, Taiwan's chemical industry could gradually lose its international competitiveness (China Post, 2005c§; Taipei Times, 2005§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Trade

In 2004, Taiwan's total trade increased by 26.0% to $341.9 billion. The values of exports and imports increased to $174.0 billion and $167.9 billion, respectively. Crude oil remained the leading imported mineral commodity by value and was followed by coal, natural gas, iron ore, marble, and kaolin. Taiwan's leading exports were products of capital- and technology-intensive sectors and included base-metal products, electrical equipment, musical instruments, and precision instruments. Traditional labor-intensive products, such as cement, footwear, and textiles, had decreased significantly during the past decade in terms of export value and percentage share of total exports. Many of Taiwan's labor-intensive industries set up plants in mainland China during the last decade. They either focused on the Chinese market to take advantage of its overwhelming consumption growth or received their orders from Taiwan and produced their goods in mainland China and then shipped them to overseas buyers. During the past several years, about 60% of Taiwan's steel exports were shipped to China. In 2004, Japan replaced China as Taiwan's leading trading partner. Taiwan's total trade with Japan was $60.4 billion followed by mainland China, with $53.8 billion, and the United States, with $52.9 billion (Ministry of Finance, 2004a, b).

Commodity Review

Metals

Aluminum.—Without any primary aluminum production on the island, aluminum product producers depended on imports of aluminum ingot and scrap to meet their needs. Owing to high production costs and a shortage of raw materials, many aluminum producers either closed down their operations or moved their production facilities to China during the past several years. In 2004, China Steel Aluminum Corp. (CS Aluminum) [a subsidiary of China Steel Corp. (CSC)] started trial production at its 35,000-metric-ton-per-year (t/yr) aluminum rolling mill (Ningpo Huayuan Aluminum-Tech Corp.) in Ningpo, Zhejiang Province, China. CS Aluminum produced about 150,000 metric tons (t) of aluminum alloy semimanufactured products and exported about 25% of its products. The remainder was sold on the domestic market. CS Aluminum renovated its alloy plant in Koahsiung during the past 2 years and increased its output capacity to 200,000 t/yr in 2004. CS Aluminum aimed to produce 200,000 t aluminum alloy ingot and semimanufactured products from imported aluminum ingot in 2005. In 2004, Taiwan imported 419,126 t of aluminum ingot; of that total, Australia provided 160,812 t; China, 147,881 t; and South Africa, 51,519 t (Ministry of Finance, 2004b, p. 634).

Copper.—Without any refined copper production, the island relied on imported copper to meet its demand. Because of surging demand for copper from the electronics sector, Taiwan's copper consumption was estimated to have increased to 660,000 t in 2004 from 615,000 t in 2003. In 2004, Taiwan imported 676,463 t of refined copper mainly from Chile (297,151 t), Australia (90,870 t), Japan (62,449 t), and Peru (58,881 t) (Ministry of Finance, 2004b, p. 623).

Iron and Steel.—Taiwan was the fifth leading crude steel producer in Asia behind China, Japan, the Republic of Korea, and India. CSC, which was the leading steel producer and the only pig iron producer in Taiwan, depended on imports of iron ore to meet its demand. Iron ore imports were mainly from Australia (5.25 Mt) and Brazil (3.01 Mt) in 2004 (Ministry of Finance, 2004b, p. 113). The increased price of iron ore affected CSC's profit margin. Even though CSC had signed long-term supply contracts with overseas suppliers, the company was considering investment opportunities in iron ore and coal mines in other countries. The company evaluated the feasibility of the Camarines iron ore mine in the Philippines to secure a steady supply of iron ore over the longer term (China Post, 2005a§).

CSC planned to reline its No. 2 blast furnace and to expand the inner volume of the furnace by 15% to between 3,300 and 3,400 cubic meters (m^3) from 2,850 m^3 in 2005. After the expansion, pig iron production was expected to increase by between 300,000 and 400,000 t/yr. CSC and its affiliate Kuei Yi Industrial Co. planned to build an iron and steel plant in Taichung that would have an output capacity of 3.6 Mt/yr of crude steel. The plant was designed to have either one large blast furnace or two small blast furnaces. The blast furnace operation was scheduled to start in 2007 (Southeast Asia Iron and Steel Institute Newsletter, 2004).

The Executive Yuan approved Formosa Plastics Group's (FPG) request to build an integrated iron and steel plant at Yunlin Offshore Industrial Zone in Yunlin County. The construction cost for the 7.5-Mt/yr steel plant was estimated to be $4.3 billion. The proposed plant would be subject to the new carbon-dioxide-emission regulation, and FPG expected that it would take 2 years to complete an environmental impact assessment study. The new plant was scheduled to begin operation in 2009 (Taiwan Headlines, 2005b§). FPG also received approval from the Chinese Government to build a 400,000-t/yr steel plant in Ningpo, Zhejiang Province. FPG established a subsidiary company (Hua Ye Steel Co.) to run the plant, which would have an output capacity of 250,000 t/yr of hot-dipped galvanizing line and 150,000 t/yr of color-coating line. Initial investment was estimated to be $18 million (Metal Bulletin, 2004a).

In 2004, Yieh United Steel Corp. (Yusco), which was the leading stainless steel producer on the island, planned to reduce its stainless steel output by 30% in July 2005. The company's stainless steel output capacity was 1 Mt/yr. During the past 2 years, the prices of nickel on the international market increased sharply but the market prices of stainless steel products remained low. Because stainless steel producers accounted for about two-thirds of the demand for nickel, the reduction in stainless steel production was expected to reduce the need for nickel. Yusco consumed an average of about 4,000 t of nickel per month and produced about 1 Mt of stainless steel in 2004. In October 2004, Yusco started up its 300,000-t/yr stainless steel cold-rolling mill in Huangpu, Guangzhou, Guangdong Province, China. Hot-rolled feed for the plant was from Yusco's

Kaohsiung plant. The plant was capable of producing 200, 300, and 400 series stainless steel cold-rolled products for the market in southern China (Metal Bulletin, 2004b, c; China Post, 2005d§).

Feng Hsin Iron and Steel Co. Ltd. planned to replace its two small electric arc furnaces with a large one at its No. 1 plant. A new ladle furnace was also included in the upgraded plan. Feng Hsin started up its 700,000-t/yr capacity 3-strand billet caster, which was supplied by Danieli Co. of Italy in 2004 (Metal Bulletin, 2004b).

Industrial Minerals

Cement.—Owing to an increased demand for construction materials in 2004, the production of cement increased slightly. Domestic demand for cement gradually decreased to 14.8 Mt in 2004 from 27.9 million metric tons (Mt) in 1993. Owing to a lack of limestone resources and limited market appetite on the island, Taiwan cement producers gradually moved their production base to China in the late 1990s and expanded their cement output capacities there. Chia Hsin Cement Corp. increased cement production to 5.5 Mt from 2.8 Mt by adding a new plant (Union Cement) in Jiangsu Province, China. Universal Cement Corp. planned to build a cement plant in Huizhou, Guangdong Province. Universal was expected to have a total cement output capacity of 3 Mt in mainland China. In addition to a cement plant in Jiangxi Province, Asia Cement Corp. was building a cement plant in Sichuan Province and another one in Wuhan, Hubei Province (Taiwan Economic News, 2005a§).

Taiwan Cement Corp.'s (TCC) mainland China cement project was positioned to take advantage of the market in southern China. TCC's investment strategy in China was to make direct investments and to form joint ventures with local cement producers. TCC and Conch Cement Group of mainland China set up a joint-venture cement plant in Xuzhou, Jiangsu Province. TCC had two wholly owned grinding plants in Juchiachiao, Anhui Province and Fuzhou, Fujian Province. TCC was building a cement plant in Yungde, Guangdong Province and a grinding plant in Liuzhou, Guangxi Province. During the past several years, the company invested $100 million in mainland China, and the output capacity of its plants was expected to reach 10 Mt by yearend 2005. TCC planned to invest $300 million to expand capacities at its existing cement plants and to build new plants in southern China during the next 3 years. The company's total cement output capacity in mainland China was expected to reach 20 million metric tons per year (Mt/yr) in 2008. Demand for high-grade cement in southern China was 120 Mt; local cement producers could supply about 20% to 30% of that demand (Taiwan Economic News, 2005b§).

Mineral Fuels

Coal.—Without any coal production, Taiwan depended on imported coal to meet its demand. Taiwan Power Co. (Taipower) was the leading coal consumer on the island and imported about 52% of Taiwan's coal imports. To reduce shipping costs, the Taiwan authorities approved Taipower's importation from China of up to 30% of the company's total coal requirements. The company planned to increase coal purchases from Indonesia and China and to reduce coal imports from Australia, South Africa, and the United States. The company also planned to increase the percentage of coal purchases made on the spot market to 60% in 2004 compared with 35% in 2002, and to consider investing in coal mines in China. Investment in China would have to be approved by the Taiwan authorities. In 2004, Taiwan imported a total of 60.75 Mt of coal; of this total, Indonesia provided 19.58 Mt; China, 18.95 Mt; and Australia, 17.93 Mt (Ministry of Finance, 2004b, p. 116).

Natural Gas and Petroleum.—FPG's subsidiary Formosa Petrochemical Corp. estimated that earnings from oil sales would exceed those from petrochemical products within the next 2 years. To address this expected boom in the oil-products market, Formosa Petrochemical invested $295 million to expand its daily oil-refinery capacity to 600,000 barrels (bbl) in 2006 from 450,000 bbl in 2004. Formosa Petrochemical exported between 60% and 70% of its total output. Formosa Petroleum depended on imported oil to feed its refinery because domestic oil production accounted for less than 2% of the island demand. FPG's naphtha-cracking complex at Mailiao, Yunlin County, also concentrated on oil products (Taiwan Headlines, 2004a§).

The Executive Yuan approved Chinese Petroleum Corp.'s (CPC) and its partners' request to invest $12 billion to build a petrochemical industrial park in Yunlin County. Initially, CPC held 49% interest in the petrochemical project, and the remaining 51% went to other interested participants. Two financial groups, China Trust Holding Co. and Fubon Holding Co., decided to pull out of the project and CPC increased its initial investment fund to $3.14 billion from $37.73 million. The remaining capital will be raised through syndicated loans. Other interested participants included Chang Chun Petrochemical Co., China Man-made Fiber Corp., Far Eastern Group, Ho Tung Chemical Corp., and Lee Chang Yung Chemical Industry Corp. The petrochemical project was scheduled to begin operation in 2010 (Taiwan Headlines, 2005a§).

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TABLE 1
TAIWAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS						
Gold, primary	kilograms	9	2	--	--	--
Iron and steel, metal:						
Pig iron	thousand metric tons	9,971	10,316	10,524	10,779	10,198
Ferrosilicon		2,975	1,181	--	--	--
Steel, crude	thousand metric tons	17,302	17,336	18,255	18,832 [r]	19,604
Nickel, refined[e]		10,000	11,000	11,000	11,000	11,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	17,572	18,128	19,363	18,474	19,050
Feldspar		409	147	--	510	900
Fire clay		3,666	5,641	2,083	7,546	3,686
Gypsum, precipitated		1,884	1,006	--	--	--
Lime[e]		800,000	800,000	800,000	800,000	800,000
Mica		6,862	9,733	6,595	3,237	2,973
Nitrogen, N content of ammonia		11,004	11,870	11,050	11,200	11,000
Salt, marine		69,521	66,150	56,720	191	--
Sodium compounds, n.e.s.:						
Caustic soda		426,040	466,630	508,760	568,180	570,000 [e]
Soda ash[e]		140,000	140,000	140,000	140,000	140,000
Stone:						
Dolomite	thousand metric tons	119	71	55	54	115
Limestone	do.	3,505	4,901	3,677	1,434	213
Marble	do.	17,831	20,475	23,736	21,041	22,970
Serpentine	do.	395	276	268	194	229
Sulfur		205,588	223,659	212,343	225,006	222,670
Talc		--	130	27	466	410
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous		83,380	--	--	--	--
Gas, natural:						
Gross	million cubic meters	742	849	887	831	796
Marketed[e]	do.	670	780	785	760	720
Petroleum:						
Crude	thousand 42-gallon barrels	234	279	321	288	280
Refinery products[e]	do.	240,000	250,000	260,000	270,000	280,000

[e] Estimated; estimated data are rounded to no more than three significant digits. [r] Revised. -- Zero.

[1] Includes data available through September 30, 2005.

TABLE 2
TAIWAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilitites	Annual capacity[e]
Cement		Asia Cement Corp.	Hsinchu	1,800
Do.		do.	Hualien	4,020
Do.		Chia Hsin Cement Corp.	Kaohsiung	1,860
Do.		Chien Tai Cement Co. Ltd.	do.	1,720
Do.		Lucky Cement Corp.	Tungao	2,000
Do.		Southeast Cement Corp.	Kaohsiung	1,090
Do.		do.	Chutung	1,400
Do.		Taiwan Cement Corp.	Hualien City	1,600
Do.		do.	Hualian County	5,600
Do.		do.	Suao	3,400
Do.		Universal Cement Corp.	Kaohsiung	1,550
Marble		Taiwan Marble Co., Ltd.	Panchiao	10
Nickel		Taiwan Nickel Refinery	Kaohsiung	14
Petroleum:				
Crude	thousand 42-gallon barrels per year	Chinese Petroleum Corp.	Chuhuangkeng and Tungtzuchiao	850
Refinery products	thousand 42-gallon barrels per day	do.	Kaohsiung	570
Do.	do.	do.	Taoyuan	200
Do.	do.	Formosa Plastics Group	Yunlin	450
Steel		China Steel Corp.	Kaohsiung	13,000
Do.		Feng Hsin Iron and Steel Co. Ltd.	Taichung Hsien	1,000
Do.		Yieh United Steel Co.	do.	1,000
Sulfur		China Petrochemical Development Corp.	Taipei	50
Titanium dioxide		DuPont Far East Co. Ltd.	Guanyin	100

[e] Estimated.

THE MINERAL INDUSTRY OF THAILAND

By John C. Wu

Thailand, which is located north of the Andaman Sea and the Gulf of Thailand, east of Burma, west of Cambodia and Laos, and north of Malaysia in Southeast Asia, was classified as a lower- to middle-income developing country by the World Bank. The country had a population of about 65.4 million. Its total area is about 514,000 square kilometers. In 2004, Thailand's gross domestic product (GDP) and per capita GDP based on purchasing power parity were estimated to be $512.3 billion and $7,900, respectively (World Bank, 2004§[1]; International Monetary Fund, 2005§; U.S. Central Intelligence Agency, 2005§).

Thailand's identified mineral resources are antimony, ball clay, barite, bentonite, copper, diatomite, dolomite, feldspar, fluorite, gold, gypsum, iron ore, kaolin, lead, limestone, manganese, marl, phosphate rock, potash, quartz, rock salt, silica sand, tin, tungsten, and zinc (Department of Mineral Resources, 1998, p. 18). Thailand also has small resources of coal, natural gas, and crude petroleum.

Resources of such industrial minerals as diatomite, dolomite, gypsum, kaolin, limestone, marl, potash, and silica sand were more abundant than other identified minerals. The resources of barite, copper, fluorite, gold, gypsum, iron ore, lead, quartz, potash, tin, tungsten, and zinc, however, have higher economic unit value. During the past 20 years, most of the identified minerals except copper and potash have been exploited for domestic consumption and export.

In 2004, Thailand was one of the world's top producers of feldspar and gypsum. Thailand also was one of the world's leading exporters of cement, feldspar, and gypsum. The mineral production of barite, coal (lignite), dolomite, feldspar, natural gas, gemstones, gold, gypsum, kaolin, limestone, crude petroleum, rock salt, silica sand, tin, tungsten, and zinc was important to the Thai economy. Some of these minerals, however, were exported to earn foreign currency. The leading export minerals were feldspar, gypsum, tin metal, tantalum powder, and zinc metal. Thailand imported such ferrous and nonferrous metals as primary aluminum, refined copper, refined lead, iron and steel, and precious metals; and such mineral fuels as bituminous coal, natural gas, and crude petroleum to meet its domestic requirements.

According to the National Economic and Social Development Board, the output of the mining and quarrying sector grew by 4.9% in 2004 compared with 6.8% in 2003. In 2004, the output value of the mining and quarrying sector, which was estimated to be $2 billion in 1988 constant dollars, contributed about 2.2% to the country's GDP and its workforce accounted for about 3% of the total labor force. The continued growth in the mining and quarrying sector was the result of increased production of such mineral fuels as lignite and natural gas, such metallic minerals as iron ore and zinc ore, and such industrial minerals as barite, dolomite, feldspar, gypsum, limestone, pyrophyllite, rock salt, and talc. The Thai economy, as measured by the GDP, grew by 6.1% in 2004 compared with 6.7% in 2003. The Thai GDP, in 1988 constant dollars, was estimated to be $91 billion in 2004 compared with $83 billion in 2003. The Thai total labor force increased to 35.8 million in 2004 from 34.9 million in 2003, and the rate of unemployment remained unchanged at 2.0% in 2004. The inflation rate, as measured by change in the Consumer Price Index, rose to 2.7% from 1.8% in 2003. The country's merchandise trade surplus dropped to $1.7 billion in 2004 from $3.8 billion in 2003 as a result of a 27% surge in imports compared with a smaller (23%) increase in exports. The country's total outstanding debt decreased slightly to $51.3 billion from $51.8 billion in 2003 (Bank of Thailand, 2004a§).

Government Policies and Programs

Thailand's mineral resources are owned by the State. Mineral exploration and development are governed by the Minerals Act of 1967, the Minerals Royalty Act No. 4 of 1966, and the Tin Control Act of 1977. The Minerals Act of 1967, which had been amended in 1973, 1979, and 1991, was amended again by Minerals Act No. 5 in 2002 for underground mining; the new amendment permits mining at depths of greater than 100 meters (m) below the surface without requiring the specific consent of the holder of the surface right. The Minerals Act governs onshore and offshore exploration, mineral production, mineral trade, ore dressing, transport, and export of minerals other than petroleum. The Minerals Royalty Act prescribes the rates of royalties to be assessed for different kinds of minerals. The Tin Control Act controls the mining and trade of tin.

Under the Minerals Act of 1967, the Ministry of Industry was appointed as the principal Government agency to regulate the mining sector. Under the Ministry, the Primary Industry and Mines Department (PI&MD) is empowered to administer the Minerals Act and to issue ministerial regulations, and the Department of Mineral Resources (DMR) is empowered to set national mineral and geological policies. The PI&MD also provides technical assistance in mining, mineral processing, and metallurgical activities under the jurisdiction of the Ministry of Industry; the DMR provides technical assistance in geologic prospecting and mineral exploration under the jurisdiction of the Ministry of Natural Resources and Environment (Department of Mineral Resources, 2004§).

Environmental Issues

In response to concerns about the cadmium contamination problem in the vicinity of Mae Tao Creek in the Mae Sot District of Tak Province and to subsequent news reports in the media, Padaeng Industry Public Co. Ltd. (PDI) reportedly commissioned the National Research Center for Environmental and Hazardous Waste Management at Chulaongkorn University to conduct a research study to find sustainable and systematic ways to solve the problem. The company expected findings of the study to be completed by early 2005, and the result of the study would be presented to relevant Government agencies as their recommendation for resolving the problems. In addition, the company has a budget of $74,400 (3 million baht) per year to assist local citizens in the area of health, standard of living, and livelihood (Padaeng Industry Public Co. Ltd., 2005§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Production

In 2004, Thailand's minerals production included barite, coal, dolomite, feldspar, natural gas, gemstones, gypsum, kaolin, limestone, crude petroleum, rock salt, silica, tin, tungsten, and zinc. The main processed mineral products were cement, fluorite (metallurgical grade), refined petroleum products, steel, refined tin, and refined zinc. Thailand also produced tantalum metal powder and oxides, which were produced from tantalum-bearing scrap and tin slag purchased from domestic and foreign sources.

In 2004, production of most industrial minerals except marble, phosphate rock, quartz, and silica sand increased. Production of metals except silver, tin, and tungsten increased considerably. In 2004, production of mineral fuels except crude petroleum increased. Production of cement, refined petroleum products, steel, refined tin metal, and refined zinc metal increased (table 1).

Trade

Exports rose by 23% to $96.1 billion in 2004 from $78.1 billion in 2003; imports rose by 27% to $94.4 billion in 2004 from $74.3 billion in 2003. Thailand's merchandise trade surplus shrank to $1.7 billion in 2004 from $3.8 billion in 2003. As a result, the Thai baht lost 1.2 baht against the U.S. dollar, which was a decrease of 2.9%, falling to 40.3 baht against US$1.00 in 2004 compared with 41.5 baht in 2003. Japan and the United States were the two major trade partners of Thailand and accounted for 18.7% and 11.8%, respectively, of total two-way merchandise trade in 2004 (Bank of Thailand, 2004b§).

Thailand was a net importer of mineral commodities mainly because of its large import bills for coal, iron and steel products, nonferrous metals, and crude petroleum. According to Thailand's Customs Department, exports of major crude and intermediate mineral products totaled $1.26 billion in 2004, of which refined tin was valued at $116 million; gypsum, $66 million; and all other mineral products, $1.07 billion. Exports of major processed mineral commodities were base-metal products, which included iron and steel, $3.9 billion; refined petroleum products, $2.6 billion; and precious stones and jewelry, $2.3 billion (Bank of Thailand, 2004a§).

In 2004, imports of major mineral fuel commodities were as follows: crude petroleum, $10.7 billion; refined petroleum products (lubricant and asphalt), $2.2 billion; coal, $304.6 million; and coke and briquette, $304 million. Imports of major nonfuel mineral products were as follows: iron and steel products, $5.8 billion; other base metal products, $2.4 billion; jewelry and silver bar, $1.8 billion; and fertilizers and pesticides, $1.1 billion (Bank of Thailand, 2004b§).

Commodity Review

Metals

Copper.—In June, Pan Australian Resources N.L. (PAR) of Australia announced that the Cabinet of the Thai Government had approved a proposal for a full feasibility study and had given approval in principle for mining at the Puthep copper project, which is located about 20 kilometers (km) southeast of Loei in northern Thailand. Before the Government approval, work had been suspended on the project because of land access restrictions imposed as a consequence of the Government's watershed zoning over the PUT 1 deposit, which is Thailand's largest known copper deposit. By December, PAR and its joint-venture partner PDI reportedly concluded an agreement with Thai Government officials on a set of conditions to be applied to the feasibility study's drilling program. PAR had approved a budget to begin the first phase of the drilling program but was still waiting for the Government's final approval to start. According to an earlier prefeasibility study, the PUT 1 deposit had the potential to become a viable copper mine that could produce more than 25,000 metric tons per year (t/yr) of copper cathode by heap leach and solvent extraction-electrowinning from a 7-million-metric-ton-per year (Mt/yr) throughput rate. The preproduction development capital was estimated to be $70 million, and operating costs were estimated to be about $0.51 per pound. The total indicated and inferred mineral resources at the PUT 1 and nearby PUT 2 deposits were estimated to be 121 million metric tons (Mt) at a grade of 0.43% copper (Pan Australian Resources N.L., 2004a§, b§).

In 2004, Thailand became a producer of refined copper for the first time. Thai Copper Industries plc., which suspended construction of its 165,000-t/yr copper smelter and refinery in Rayong Province in eastern Thailand in March 1998, completed construction of the smelter and refinery in 2004. In January 2003, the $115 million construction contract was awarded to Aker Kvaerner OGEP of Norway to complete the project. The $580 million copper smelter and refinery complex is located at Rayong Industrial Park in Rayong Province and was initially scheduled to be commissioned by April 2004. Through its affiliates Kvaerner E&C (Thailand) Ltd. and Kvaerner U.S. Inc., Aker Kvaerner was responsible for the project and completed the Thai Copper project on May 6, 2004 (Aker Kvaerner OGEP, 2004§).

The smelter/refinery complex in Rayong Province reportedly began operations on September 24, 2004, with an initial capacity of 72,000 t/yr of copper cathode; the company planned to double the capacity to 165,000 t/yr in 2005. According to the officials of Thai Copper, the company planned to start negotiating with BHP Billiton Ltd. of Australia and Corporación Nacional del Cobre de Chile to secure the long-term supply of 90% of the smelter's raw material requirement (copper concentrates) and to purchase the remaining 10% from the spot market. The smelter's stockpile of 120 000 metric tons (t) of copper concentrates, which was imported mainly from Australia and

Chile in 2004, was expected to run out during the first quarter of 2005 (Business Day, 2004a§, b§; Metalworld.com, 2005§).

According to the International Copper Study Group (2005), Thai Copper produced about 20,000 t of copper cathode in 2004.

Gold.—Kingsgate Consolidated N.L. of Australia, through its 90% owned subsidiary Akara Mining Ltd., produced gold from the Chatree Mine, which is located 45 km southeast of the provincial capital of Phichit on the border of Petchabun and Phichit Provinces. According to Kingsgate Consolidated, for the financial year 2004 that ended on June 30, 2005, production of gold decreased by 15.6% to 3,936 kilograms (kg) (126,550 troy ounces) from 4,665 kg (149,979 troy ounces) for financial year 2003. The lower gold production in fiscal year 2004 was a result of lower grade ore with a higher ratio of waste to ore. In July, the company completed construction of a second mill, which would enable the gold mine to process up to 1.8 Mt/yr of ore compared with 1.32 Mt/yr in fiscal year 2004. As a result, Kingsgate Consolidated expected to raise the production of mined gold in financial year 2005 to between 4,510 kg (145,000 troy ounces) and 4,666 kg (150,000 troy ounces) (Thaipro.com, 2004§; Mineweb.net, 2005§).

In 2004, a grade-control drilling program in the Tawan Pit at the Chatree Mine reportedly discovered an ore zone with high gold grades. According to Kingsgate Consolidated, this high-grade zone is located within the mining lease in the recently discovered extension to the H ore body. The zone, which has many intersections and contains more than 100 grams per metric ton gold, is about 75 m long, 20 m wide, and at least 10 m deep. The discovery of this high-grade gold zone confirmed the potential for the deposit to host higher grade gold zones (Minebox.com, 2004§)

Iron and Steel.—Iron ore production rebounded to 135,580 t from 9,675 t in 2003. Thailand continued to rely heavily on imports of ferroalloys, pig iron, steel scrap, and crude steel (billet, slab, and ingots) to meet the requirements of its steel sector.

In 2004, Thailand's crude steel production increased by 27% to 4.53 Mt from 3.57 Mt in 2003 (Southeast Asia Iron and Steel Institute, 2005§). Thailand's crude steel was produced by electric arc furnaces, which used mostly imported iron and steel scrap.

In July 2004, the Ministry of Industry reportedly commissioned the Iron and Steel Institute of Thailand to conduct a feasibility study on the prospects for a major development of new iron-reduction plant capacity in Thailand. According to a senior official, two possibilities were being investigated—a plant with the capacity of from 1 to 2 Mt/yr on the eastern seaboard or a plant with the capacity of from 4 to 5 Mt/yr in Prachuap Khiri Khan Province where Thailand's leading producer of hot-rolled steel coil, Sahaviriya Steel Industry Co. Ltd., was located. The prospects for going upstream are limited because of China's ability to build low-cost facilities and its expanding iron-reduction capacity (Southeast Asia Iron and Steel Institute, 2004c§).

In September 2004, however, Sahaviriya Steel announced plans to launch a $12.4 billion ironmaking and steelmaking project that would have a final capacity of 30 Mt/yr. The project, which will comprise five phases during a period of 15 years, would be located at its steel complex in the Bang Saphan District, Prachuap Khiri Khan Province. According to Sahaviriya Steel, upon completion, the project would make Thailand a major steel exporter rather than a net steel importer. The Sahaviriya Group Corp. Ltd. had invested more than $1.7 billion to set up 23 steel-processing plants in Bang Pakong, Bang Saphan, and Prapadaeng. Beginning in 2005, the Group would have a combined total rolling capacity of 7.6 Mt/yr, of which Sahaviriya Steel would have the capacity to produce 4 Mt/yr of hot-rolled coil; Sahaviriya Plate Mill, 1 Mt/yr of heavy plate; Sahaviriya Sahap Steel and Bang Saphan Bar Mill, 1 Mt/yr each of sections and rebar; and BP Wire Rod, 600,000 t/yr of steel products (Southeast Asia Iron and Steel Institute, 2004d§).

In November 2004, Sahaviriya Steel announced that it expected its sales to increase by 45% to $1.24 billion in 2005 because of its plant expansion. The company planned to start production at a new plant in Prachuap Khiri Khan Province in February 2005. The capacity of the new plant would be 4 Mt/yr of rolled steel compared with 2.4 Mt/yr in 2004 (Southeast Asia Iron and Steel Institute, 2004b§).

In August 2004, Natsteel Ltd. signed a definitive equity share subscription (sell/purchase) agreement with Tata Iron and Steel Co. Ltd. of India to sell its steel business to Tata Iron and Steel in an all-cash deal for $285 million. Natsteel planned to use the money from the sale to expand its chemicals and construction businesses. The acquisition would give Tata Iron and Steel a presence in China, the Philippines, Thailand, and Vietnam (Southeast Asia Iron and Steel Institute, 2004a§).

Lead.—An economic analysis of lead mining in Kanchanaburi Province, which was funded by the DMR, was completed in December 2003. The purpose of the study was to examine the economic justification for isolating part of the forest reserves in Kanchanaburi Province as an economic zone designed for mining operations. To justify such zoning, the benefit of mining was weighed against its social costs. One of the social costs that had been focused on in the study was the impact on health.

The major findings of the study were as follows: the health impact and other environmental impacts of lead mining at Klitty village can be minimized by proper management, and the economic feasibility of lead mining shows a small net social return owing mainly to declining world lead prices during the study period. The study, however, recommended that lead mining might continue at the Song-Tor Mine site, but not at the Bor-Wgam Mine site; and that proper economic zoning of lead and other mineral resources should be carried out to prevent future impacts on health from improper land use (Thailand Development Research Institute, 2003§).

Tin.—In 2004, production of tin continued its 2002 downward trend and reached a record low of 724 t of tin in concentrate. To meet its tin smelter's raw material requirement, Thailand imported 12,753 t of tin concentrate from Australia, Bolivia, Laos, Peru, and Portugal. Production of refined tin by Thailand Smelting and Refining Co. Ltd. (Thaisarco), however, increased by 35% to 20,800 t. Reports on the impact of the December 2004 tsunami on tin in southern Thailand were not available. Production of tin could be lower in 2005. The impact report of the tsunami on the production of refined tin at the Thaisarco's tin smelter on Phuket Island was also not available. Metal production could be maintained at the same level if the plant facilities were not severely damaged by the tsunami. Thaisarco produced regular refined tin metals, Thaisarco brand tin with 99.85% tin and low-lead tin metals with 50 or 100 parts per million lead, tin-lead and lead-free solders, tin alloys, pewters, and tin powders. In 2004, Thailand exported refined tin mainly to the Netherlands (46%), Japan (28%), the Republic of Korea (3%), and Belgium (2%) (World Bureau of Metal Statistics, 2005, p. 127; Thailand Smelting and Refining Co. Ltd., 2005§).

Zinc.—Zinc silicate ore produced mainly from the Mae Sot Mine by PDI totaled 167,024 t in 2004 compared with 249,539 t in 2003. The average metal content of zinc silicate ore produced was 26% zinc in 2004 compared with 25% zinc in 2003. According to PDI, a full-scale flotation plant, which upgraded the low-grade ores to concentrates, was commissioned next to the existing flotation plant. The new flotation plant would increase production of concentrate by as much as 97,000 t. The Mae Sot Mine had been in operation for 21 years. The remaining ore reserves were estimated to be 3.6 Mt at a grade of 12.7% zinc (Padaeng Industry Public Company Ltd., 2005§).

In 2004, PDI smelter in Tak, which is located 96 km from the Padaeng Mine, received 185,537 t of zinc concentrate from the Mae Sot Mine. In addition, PDI imported a total of about 106,000 t of zinc concentrate (zinc sulfide) at a higher cost than the previous year from Australia, North America, and South America because of lower levels of worldwide ore production. PDI also purchased a small amount of silicate ore and oxide raw materials from such neighboring countries as Burma and Laos (Padaeng Industry Public Co. Ltd., 2005§).

PDI's zinc smelter in Tak produced 108,577 t of cathode zinc, which was about 95% of its total capacity of 115,000 t/yr. The overall production of zinc metal was 115,112 t, of which 68,285 t was SHG products (zinc ingot) and 46,827 t, alloys. In 2004, PDI extended its range of zinc alloys production by starting to produce alloy with high aluminum content (up to 10%) for the galvanizing industry (Padaeng Industry Public Co. Ltd., 2005§).

Industrial Minerals

Cement.—The continued growth in domestic demand for cement by the construction industry for housing projects, which grew by about 7.3% in 2004, had resulted in a 9.5% increase in cement production to 35.6 Mt and a 4.4% increase in clinker production to 35.1 Mt in 2004. This growth was largely the result of Government policies that stimulated housing demand. Some of the growth momentum was lost when tax incentives for home buyers expired in the first quarter of 2004, and housing loans become harder to get. According to a Thai industry analyst, the building materials industry, however, was expected to maintain growth of 10% until 2005 (Bangkok Post, 2005§).

In 2004, the cement industry's production capacity remained the same as in 2003 at about 54 Mt/yr. According to Siam Cement Industry Co. Ltd, domestic demand was estimated to be around 26 Mt in 2004. Thai demand for cement was expected to continue growing at between 10% and 11% to about 28 Mt in 2005 because of public infrastructure spending that included transport projects and expansion of power generation capacity (International Cement Review, 2005; Bangkok Post, 2005§). According to the Thai Customs Department, exports of cement decreased slightly to 11.9 Mt in 2004 from 12.2 Mt in 2003 and 17.7 Mt in 2002 (Bank of Thailand, 2004b§).

In early 2004, eight Thai cement producers reached an agreement to cut their exports to zero gradually within the next 5 years after the Prime Minister expressed concern about the industry's impact on the environment. The Government expressed confidence that Thai cement producers would be able to reduce exports as planned and that the lost revenue could be offset by rising demand from the recovering real estate sector (International Cement Review, 2004a).

Siam Cement, which maintained its leading position in the Thai cement industry, operated at about 80% of its capacity of 23.2 Mt/yr in 2004. The company exported 6 Mt of cement and planned to export 7 Mt in 2005. In June 2004, the company announced that it planned to expand capacity for dry mortar by 200,000 t in mid-2005. The planned expansion was in response to growing demand in the Thai cement market (Siam Cement Group, 2005§).

Siam City Cement Public Co. Ltd., which was Thailand's second ranked cement producer, operated at 76% of its capacity of 14.5 Mt/yr and maintained its 28% domestic market share in 2004. The company sold 10.4 Mt of cement in 2004, of which 7.1 Mt was for domestic sales, and made a net profit of $108 million because of higher domestic sales. The company was expected to operate at full capacity in 2005 (International Cement Review, 2005).

TPI Polene Co. Ltd., which was Thailand's third ranked cement producer and had 18% of the domestic market share, announced that it planned to spend about $148.9 million (6 billion baht) to expand its cement production capacity by 3.3 Mt/yr to 13.2 Mt/yr because of increasing demand for cement owing to the Government's infrastructure and utilities development projects. According to the company's plan, the capacity expansion project would be completed by the end of 2005 (International Cement Review, 2004b).

Feldspar.—Thailand was one of the world's leading producers of sodium feldspar. The country also produced a small amount of potassium feldspar. In 2004, overall production of feldspar reached more than 1 Mt for the first time. A small amount of potassium feldspar was produced from the Provinces of Kanchanaburi, Prachuap Khiri Khan, and Ratchaburi in the Central Region. Sodium feldspar was produced mainly from Tak Province in the Northern Region and from the Provinces of Nakhon Si Thammarat and Trang in the Southern Region. Thai feldspar was exported mostly to such Asian countries as Indonesia, Japan, Malaysia, the Philippines, Taiwan, and Vietnam. The United Arab Emirates was the major importer of Thai feldspar outside of Asia and the Pacific region. Asia Mineral Processing Co. Ltd. (AMPC), which was Thailand's leading producer of feldspar, was the leading producer and distributor of feldspar products in Southeast Asia. AMPC produced various grades of potassium feldspar, sodium feldspar, and mixed products from open pit mines in seven concessions in the Provinces of Nakhon Si Thammarat and Trang. The Amphoe Tha Sala and the King Amphoe Nob Phi Tam areas contain a total of more than 1.5 Mt of ore reserves, which accounted for about 1.5% of the country's total estimated feldspar reserves of 100 Mt (Department of Mineral Resources, 1998, p. 18). AMPC processing facilities are located in the Province of Trang near the Port of Kantang along the Andaman Sea and in the Province of Nakhon Si Thammarat near the Port of Tha Sala along the Gulf of Thailand (Asia Mineral Processing Co. Ltd., 2005§).

Potash.—In November 2004, Asia Pacific Resources Ltd. (APR) applied for a mining lease for the majority of the land originally held under the Special Prospecting Licenses that contained all the Undon North project areas where previous exploration by drilling and seismic work identified potash resources. APR indicated that this mining lease application had been duly registered by the Government and that the Government had advised the company that it has first priority under the terms of its concession agreement with the Government. In May 2003, APR submitted an application for four mining leases for the mining area that covers the potash deposits in Udon Thani South, and the Government reportedly began processing the application upon completion of the revised regulations early in 2004. APR was hoping that the mining lease for the Udon South deposit would be granted in 2005 (Asia Pacific Resources Ltd., 2004§).

The Udon South deposit was estimated to contain a potash resource of 302 Mt at a grade of 23.5% potassium oxide (K_2O). The measured and indicated resources totaled about 30 Mt at a grade of 26.8% K_2O within a high-value core area that averaged 7.2 m in thickness. The Udon North deposit was estimated to contain 665 Mt of potash resources, of which 175 Mt was indicated resource at a grade of 19.0% K_2O and an average thickness of 12 m and 490 Mt inferred resource at a grade of 16.5% K_2O and an average thickness of 12 m (Asia Pacific Resources Ltd., 2005a§, b§).

Mineral Fuels

Coal.—Thailand was an important coal producer in Asia and the Pacific region. Its coal production, however, could not meet Thailand's demand by its cement, electric utility, and iron and steel industries. In 2004, coal (lignite) production increased by 6.5% to 20.1 Mt from 18.8 Mt in 2003. The state-owned Electricity Generating Authority of Thailand (EGAT), which operated the Mae Moh Mines in the Province of Lampang, produced about 16.68 Mt (Electricity Generating Authority of Thailand, 2004§). The remaining 3.4 Mt was produced by EGAT, Banpu Mineral Co. Ltd., and Chiang Muan Mining Co. Ltd., which operated coal mines in the Provinces of Lampang, Lamphum, and Phayao. To meet the overall coal demand, Thailand imported 7.6 Mt of coal, which was valued at $204.6 million in 2004. Of that total, bituminous coal accounted for 7.1 Mt compared with 6.5 Mt imported in 2003; anthracite, 355,130 t compared with 532,860 t imported in 2003; and coking coal, 66,390 t compared with 64,750 t imported in 2003 (Energy Policy and Planning Office, 2005c§).

An environmental impact assessment (EIA) for the proposed development of lignite resources at Wiang Haeng District in the Province of Chiang Mai had been conducted by EGAT, which was permitted to develop the coal basin without a bidding process provided that the project's EIA was approved by the Government. In May 2004, Chiang Mai University was appointed to conduct the EIA for the project; the process would include a public participation component to allow the local community to participate in the environmental impact study, which was scheduled to be completed in mid-2005. The Wiang Haeng Basin was estimated to contain about 139 Mt of high-quality coal reserves suitable for electricity generation, which EGAT planned to mine to supplement the lignite fuel for the Mae Moh powerplant in the Province of Lampang (Electricity Generation Authority of Thailand, 2004§).

Consumption of domestically produced lignite totaled 20.5 Mt in 2004, of which 16.5 Mt was consumed by EGAT in power generation at the 2,625-megawatt Mae Moh lignite-fired powerplant and 3.9 Mt was consumed as energy by the manufacturers of cement, fiber, lime, and paper; tobacco curers; and other users. Imported coal (mostly anthracite, bituminous, and coking coal), which totaled 7.6 Mt, was consumed mainly by the manufacturers of cement and ferrous and nonferrous metals (Energy Policy and Planning Office, 2005c§).

Natural Gas and Petroleum.—Thailand's natural gas production increased by 3.2% to an average of 61.3 million cubic meters per day in 2004 from an average of 59.4 million cubic meters per day in 2003 owing mainly to a 36% increase in output from the Bong Kot and the Pailin Gasfields. In 2004, natural gas was produced from 20 gasfields, most of which were offshore. About 54.5% of Thailand's natural gas was produced by Unocal Thailand Ltd. (UT) from offshore gas and condensate fields (Baanpot; Erawan; Funan; Gomin; Jakarawan; Kaphong, which was brought onstream by UT in early 2004; Pailin; Platong; Satun; South Satun; and Trat); the remaining 45.5% was produced by PTT Exploration and Production (PTTEP) [a wholly owned subsidiary of the state-owned Petroleum Authority of Thailand (PTT)], ChevronTexaco Corp., and other companies, from offshore gasfields (Benjamas, Bong Kot, Plamuk, Plandaeng, Surat Thani, Tantawan, and Yala) and onshore gasfields (Nam Phong and Sirikit) (Energy Policy and Planning Office, 2004b§).

UT, which was Thailand's leading gas producer, operated 100 platforms in the central Gulf of Thailand. UT supplied 75% of its natural gas output to meet 33% of Thailand's power generation requirement and 25% to meet fuel requirements for the manufacturing and transportation industries, for household cooking, and as feedstock for petrochemicals. In late 2004, UT announced a plan for an extensive drilling program in the Gulf of Thailand to meet expected higher demand for gas, when PTT completed a third pipeline from gasfields in the Gulf of Thailand to onshore facilities in 2006. Under the plan, UT intended to drill between 30 and 45 wells on its four offshore contract areas between 2005 and 2007. The company also planned to bring the South Gomin Gasfield onstream in late 2006. The South Gomin Gasfield project was 71.25% owned by UT; 23.75%, by Mitsui Oil Exploration; and 5%, by PTT (Petroleum Economist, 2004b).

In December 2003, a share-purchase agreement was reached between PTTEP and its subsidiary PTTEP Offshore Investment Co. Ltd. and Thai Shell Exploration and Production Co. Ltd. (Thai Shell), which was the Thai upstream unit of Royal Dutch/Shell plc, for the entire issued equity share of Thai Shell for about $205 million. The asset, which included the onshore S1 block (75% owned by Shell and 25%, by PTTEP), the offshore B6/27 block (100% owned by Thai Shell) in the Gulf of Thailand, and the onshore L22/43 block (65% owned by Thai Shell and 35%, by PTTEP) was valued by Thai Shell at $1 billion (Petroleum Economist, 2004a; Platts.com, 2003§).

Production of crude petroleum decreased by 11% to an average of 85,750 barrels per day (bbl/d) from 96,322 bbl/d in 2003 as a result of a 10% decrease in output from the onshore Sirikit Oilfield and a 13% decrease in output from the offshore Tantawan Oilfield. Production of condensate increased by 9% to an average of 68,390 bbl/d from 62,663 bbl/d in 2003; this was mainly the result of a 12% increase in output from the Pailin Gasfield and a 13% increase in output from the Bong Kot Gasfield. In 2004, crude petroleum was produced from 10 oilfields. The Benjamas, which was the largest offshore oilfield, was operated by Chevron Offshore (Thailand) Ltd. and produced 46.3% of the country's total. The Sirikit, which was Thailand's largest onshore oilfield, was operated by Thai Shell and produced 19.9% of the total. The Plamuk, which was Thailand's second ranked offshore oilfield, was operated by UT and produced 25.8%. The Tantawan, which was Thailand's third ranked offshore oilfield, was operated by Chevron Offshore (Thailand) and produced 5.3% in 2004. In November 2003, Chevron Offshore (Thailand) reportedly discovered oil and gas in two exploration wells in Block 9A in the Gulf of Thailand. The company applied for a production area license for the Tantawan 23 and the Tantawan 24 wells. The remaining 2.7% was produced from six smaller oilfields. In 2004, about 27.9% of condensate was produced from the Pailin Gasfield; 25.9%, from the Bongkot Gasfield; 17.2%, from the Erawan Gasfield; and the remaining 29%, from seven smaller fields (Energy Policy and Planning Office, 2005a§, b§).

To meet its overall demand for crude petroleum, Thailand imported 872,300 bbl/d of crude petroleum compared with 775,900 bbl/d in 2003. Thailand's total refining capacity was 703,100 bbl/d of crude petroleum. Shell Co. of Thailand Ltd. had a 275,000-bbl/d crude capacity refinery in Map Ta Phut, Rayong Province; Thai Oil Co. Ltd. had a 192,850-bbl/d crude capacity refinery in Sriracha, Chonburi Province; Esso Standard Thailand Ltd. had a 173,500-bbl/d crude capacity refinery in Sriracha, Chonburi Province; and PTT Plc had a 61,750-bbl/d crude capacity refinery in Bang Chak, Bangkok (Oil & Gas Journal, 2002, p. 110).

In August 2004, Shell International Holding Ltd. announced that it reached a share-sell agreement to sell its entire 64% equity share in Rayong Refinery Co. Ltd. to PTT. Rayong Refinery, which has been in operation since 1996, was 64% owned by Thai Shell and 36%, by PTT (Royal Dutch Shell plc., 2004§).

Outlook

During the next 4 to 5 years, the Thai mineral sector is expected to expand and contribute more to the country's GDP because of the likely development of the Puthep copper deposit in the Province of Loei, the Udon South and the Udon North potash deposits in the Province of Udon Thani, and the Wiang Haeng coal (lignite) mine in the Province of Chiang Mai as well as development and expansion of new and existing offshore gasfields in the Gulf of Thailand. During the next 2 years, the mineral industry of Thailand is expected to continue to be dominated by the production of coal, gold, gypsum, and limestone. Thailand is expected to become the eighth ranked refined copper producer after China, Japan, the Republic of Korea, Australia, India, Indonesia, and the Philippines in Asia and the Pacific region by 2005.

Thailand's economy is forecasted to continue to grow at about the same rate as in 2004. The International Monetary Fund projects that Thailand's GDP will grow at a rate of 5.6% in 2005 and 6.2% in 2006 (International Monetary Fund, 2005§). As a result, demand for cement, steel, nonferrous metals, and mineral fuels is expected to continue to grow in 2005 and 2006 at about the same rate as that of 2004.

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  Annual report, annual.
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Department of Mineral Resources:
  Mineral Statistics of Thailand, annual.
  Metal Statistics of Thailand, annual.

TABLE 1
THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS						
Antimony:						
Ore:						
Gross weight		178	40	3	83	110
Sb content		84	18	1	38	52
Metal, smelter		16	12	--	--	2
Copper, metal, refined:						
Primary		--	--	--	--	17,700
Secondary		--	--	--	--	1,900
Total		--	--	--	--	19,600
Gold	kilograms	--	320	4,950	4,269	4,500
Iron and steel:						
Iron ore:						
Gross weight		100	50	570,110	9,675	135,580
Fe content[e]		50	25	285,000	4,800	68,000
Crude steel	thousand metric tons	2,100	2,127	2,538	3,572	4,533
Lead:						
Ore:						
Gross weight		24,760	800	6,500	--	--
Pb content		15,600	500	3,200	--	--
Metal, refined:						
Primary		3,390	3,500	2,000	2,000	2,000
Secondary		23,803	23,000	28,000	28,000	28,000
Total		27,193	26,500	30,000	30,000	30,000
Manganese ore:						
Battery- and chemical-grade, 75% MnO_2		225	45	--	--	--
Metallurgical-grade, 46% to 50% MnO_2		--	--	--	--	4,550
Total, gross weight		225	45	--	--	4,550
Total Mn content[e]		110	23	--	--	2,180
Silver	kilograms	--	1,159	18,018	12,496	10,700
Tantalum, metal and oxide powder		210	150	102 [r]	168 [r]	317
Tin:						
Concentrate:						
Gross weight		2,363	2,383	1,384	980	724
Sn content		1,930	1,950	1,130	793	586
Metal, primary		17,076	22,387	17,548	15,400 [r]	20,800
Tungsten concentrate:						
Gross weight		54	92	53	390	337
W content[e]		30	50	31	208	180
Zinc:						
Ore:						
Gross weight		159,093	88,664	151,876	148,297	199,477
Zn content[e]		27,000	15,300	33,600	37,100	43,400
Metal, primary		77,525	74,129	72,502	69,600	68,300
Alloy, Zn content		23,617	30,668	32,646	44,086	46,800
Zirconium concentrate, gross weight		100	--	--	--	--
INDUSTRIAL MINERALS						
Barite		56,180	23,559	137,469	115,600	211,278
Cement, hydraulic	thousand metric tons	25,499	27,913	31,679	32,530	35,626
Clays:						
Ball clay		394,154	341,272	450,818	579,404	610,193
Kaolin, marketable:						
Beneficiated, washed		201,226	168,063	127,132	184,562	200,671
Nonbeneficiated, unwashed		286,912	125,133	168,883	373,811	430,364
Filler		19,836	13,520	3,150	950	--
Diatomite		390	720	780	1,288	1,372
Feldspar		542,991	710,543	783,733	824,990	1,001,053
Fluorspar, crude, metallurgical-grade		4,745	3,020	2,270	2,368	2,375

See footnotes at end of table.

TABLE 1--Continued
THAILAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
INDUSTRIAL MINERALS--Continued						
Gemstones	thousand carats	928	1,071	1,597	716	911
Gypsum	thousand metric tons	5,830	6,191	6,326	7,291	7,619
Mica		107	72	--	--	--
Perlite		6,000	9,915	7,600	5,700	6,000 [e]
Phosphate rock, crude		3,260	2,359	3,680	13,870	2,580
Salt:						
Rock		792,250	852,565	908,968	892,243	1,031,200
Other[e]		100,000	100,000	100,000	100,000	100,000
Sand, silica, glass		471,547	513,880	781,014	1,293,929	587,655
Stone:						
Calcite		87,100	159,050	172,760	232,025	436,628
Dolomite		625,127	871,308	933,209	865,708	992,907
Granite:						
Dimension stone	cubic meters	7,595	6,659	7,597	9,866	10,000 [e]
Industrial rock	thousand metric tons	2,154	2,546	3,370	3,107	3,500 [e]
Limestone:						
For cement manufacture only	do.	43,492	46,984	54,214	46,868 [r]	63,196
Construction and other uses	do.	37,017	40,100	56,226	66,073	70,000 [e]
Marble, dimension stone and fragment	cubic meters	270,036	314,445	461,272	339,166	236,643
Marl for cement manufacture only		7,290	7,755	83,135	80,405	184,750
Quartz		5,177	48,908	32,954	65,559	19,216
Shale for cement manufacture only	thousand metric tons	3,110	3,364	5,017	2,982 [r]	3,622
Talc and related materials:						
Pyrophyllite		46,011	59,602	103,496	73,556	108,691
Talc		7,390	6,838	1,702	8,501	12,592
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite	thousand metric tons	17,786	19,607	19,572	18,843 [r]	20,060
Natural gas, gross production	million cubic meters	20,190	19,637	20,527	21,677 [r]	22,366
Petroleum:						
Crude	thousand 42-gallon barrels	21,147	22,599	27,582	34,990 [r]	31,158
Natural gas condensate	do.	19,060	18,924	19,609	23,161 [r]	25,030
Refinery products:						
Liquefied petroleum gas	do.	32,511	37,067	37,069	38,872	41,520
Gasoline	do.	50,862	52,376	51,896	54,342	56,339
Jet fuel	do.	27,347	26,651	29,373	26,778	29,127
Kerosene	do.	3,090	3,693	3,457	4,386	7,041
Distillate fuel oil	do.	43,970	40,669	37,610	38,248	42,277
Residual fuel oil[e]	do.	22,000	22,000	22,000	23,000	24,000
Unspecified[e, 2]	do.	3,500	3,500	3,500	3,500	3,600
Total[3]	do.	183,000	186,000	185,000	189,000	204,000

[e] Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r] Revised. -- Zero.

[1] Includes data available through September 23, 2005.

[2] Includes refinery fuel and refinery gains or losses.

[3] Data are rounded to three significant digits.

Sources: Department of Mineral Resources, Mineral Statistics of Thailand; Department of Primary Industries and Mines; Ministry of Commerce, Energy Policy and Planning Office; and U.S. Geological Survey, Mineral Questionnaires, 2003-2004.

TABLE 2
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Barite	Asian Mineral Resources Co. Ltd.	Loei, Mae Hong Son, Nakhon Si Thammarat, and Satun Provinces	60
Do.	P & S Barite Mining Co. Ltd.	Loei and Nakhon Si Thammarat Province	60
Cement	Asia Cement Co. Ltd.	Pra Phutthabath, Saraburi Province	4,800
Do.	Jalaprathan Cement Co. Ltd. (Cement Francais S.A., 37%; Veatprapat Holding Co. Ltd., 19%; others, 44%)	Takli, Nakhorn, Sawarn Province; and Cha-Am, Petchburi Province	2,350
Do.	Samukee Cement Ltd.	Pakchong, Nakhon Ratchasima Province	125
Do.	Saraburi Cement Co. Ltd. (CEMEX Asia Holdings Ltd. of Mexico, 99%)	Chalerm Phrakiat, Saraburi Province	700
Do.	Siam Cement Industry Co. Ltd. (Bureau of the Crown Property, 30%; Thai Security Depository Co. Ltd., 6.94%; CPB Equity Co. Ltd., 5.6%; other financial Institutions and general public, 57.46%)	Kaeng Khoi, Phabhudhabat, and Khao Wong, Saraburi Province; Chae hom, Lampang Province; Thung Song, Thammarat Province; and Ta Luang, Ayutthaya Province	23,200
Do.	Siam City Cement Co. Ltd. (Holcim Ltd. of of Switzerland, 33.7%; Ratanarak family, 27%; other investors, 39.3%)	Kaeng Khoi, Saraburi Province	14,500
Do.	TPI Polene Public Co. Ltd.	Kaeng Khoi, Saraburi Province	9,900
Coal, lignite	Electricity Generating Authority of Thailand	Mae Moh, Lampang Province; Li, and Lamphun Province	20,000
Do.	Lanna Resources Public Co. Ltd.	Baan Pa Kha, Lampang Province; and Nong Ya Plong, Petchburi Province	1,800
Copper, refined	Thai Copper Industries Co. (Thai Asset Management 40%; Thai Film Industry, 30%; Aker Kvarmer, 30%)	Rayong, Rayong Province	165
Feldspar, concentrate	Asia Mineral Processing Co. Ltd.	Provinces of Nakhon Si Thammarat and Trang	500
Fluorspar, concentrate	Asian Mineral Resources Co. Ltd.	Mae Hong Son Province	14
Gas, natural million cubic meters per day	Esso Exploration and Production Khorat Inc.	Namphong, Khon Kaen Province	4
Do. do.	TOTAL Exploration and Production (Thailand)	Bongkot in the Gulf of Thailand	15
Do. do.	Unocal Thailand Ltd.	Baanpot, Erawan, Funan, Kaphong, Pladang, Satun, Pailin, Trat, all in the Gulf of Thailand	33
Gold kilograms	Akara Mining Ltd. (Kingsgate Consolidated N.L. of Australia, 100%)	Chatree, Pichit Province	5,000
Gypsum	Thai Gysum Products Pcl. (Thaigips Holdings Ltd., 40.75%; BPB Gypsum B.V., 30%; others, 29.25%)	Nong Bau, Nakhon Sawan Province and Ban Munnak, Phichit Province	2,000
Do.	Vanich Gypsum Co. Ltd.	Khlong Prab, Mai Riang. Thoong Yai Mai in Provinces of Nakhon Si Thammarat and Surat Thani	2,000
Lead, in concentrate	Kanchanaburi Exploration and Mining Co. Ltd.	Song Toh, Nong Phai, and Bo Ngam in Kanchanaburi Province	30
Petroleum, crude, includes condensate thousand 42-gallon barrels per day	Chevron Offshore (Thailand) Ltd.	Benjamas, Tantawan, offshore in the Gulf of Thailand	35
Do. do.	Thai Shell Exploration and Production Co. Ltd.	Sirikit in Kamphaenghet Province	24
Do. do.	TOTAL Exploration and Production (Thailand)	Bongkot, offshore in the Gulf of Thailand	12
Do. do.	Unocal Thailand Ltd.	Baanpot, Erawan, Funan, Gomin, Jakrawan, Kaphong, Pailin, Platon, Satun, Surat, Trat Plamuk, offshore in the Gulf of Thailand	38
Steel, rolled	The Bangkok Iron and Steel Works Co. Ltd.	Phrapradaeng, Samutprakarn Province	120
Do.	Bangkok Steel Industry Public Co. Ltd.	do.	300
Do.	Millenium Steel Co. Ltd. (Siam Cement Public Co. Ltd., 45%; McDonald Investment, 6.5%; and other investors, 48.5%)	Provinces of Chon Buri, Muang Rayong, and Saraburi	1,700
Do.	Namheng Steel Co. Ltd.	Lopburi Province	350
Do.	Sahaviriya Group Corp. Ltd.	Bang Saphan, Prachuap Khiri Khan Province	2,400
Do.	Siam United Steel Co. Ltd.	Rayong Province	1,000
Do.	Siam Yamato Steel Co. Ltd.	Muang, Rayong Province	600

TABLE 2--Continued

THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Tantalum, metal powder and oxides	metric tons	H.C. Starck (Thailand) Co. Ltd. (H.C. Starck GmbH, 94.98%, and others, 5.02%)	Map Ta Phut, Rayong Province	250
Tin:				
Concentrate		Numerous small companies	Nakhon Si Thammarat, Phangnga, Phuket, and Ranong Provinces	3
Refined		Thailand Smelting and Refining Co. Ltd. (Amalgamated Metal Corp., 75.25%, and other, 24.75%)	Phuket, Phuket Province	30
Zinc:				
In concentrate		Padaeng Industry Public Co. Ltd. (Umicore SA of Belgium, 44.77%; Ministry of Finance, 13.81%; others, 41.42%)	Mae Sot, Tak Province	65
Refined		do.	Tak, Tak Province	115

THE MINERAL INDUSTRY OF VIETNAM

By John C. Wu

Vietnam, which is located north of the Gulf of Thailand, est of the Gulf of Tonkin and the South China Sea, east of Cambodia and Laos, and south of China in Southeast Asia, was a low-income developing country. Its per capita gross domestic product (GDP) and GDP based on purchasing power parity were estimated to be $2,570 and $211 billion, respectively, in 2004. Vietnam's total area is about 329,600 square kilometers (km^2). It had a population of about 82.7 million in 2004 (International Monetary Fund, 2005§[1]; U.S. Central Intelligence Agency, 2005§).

According to the Department of Geology and Minerals of Vietnam, the identified mineral resources were barite, bauxite, carbonate rocks (limestone and marble), chromium, coal, copper, natural gas, gemstones (ruby and sapphire), gold, graphite, iron ore, lead, manganese, nickel, crude petroleum, phosphate rock (apatite), rare earths, silica sand, tin, titanium (ilmenite and rutile), tungsten, zinc, and zirconium (Le, Van De, 1996; Lai Hong Thanh, 2002§; Truong Duc Chinh, 2002§). Vietnam was one of the world's leading producers of anthracite coal and one of the region's leading producers of ilmenite and phosphate rock. In 2004, Vietnam ranked sixth in production of crude petroleum in the Asia and the Pacific region (Oil & Gas Journal, 2004).

With the exception of carbonate rocks, coal, and hydrocarbons, most mineral resources were largely unexploited owing to Vietnam's outdated mining equipment and technology, poor infrastructure, and uncompetitive Government policy to attract foreign investors in mining. Several foreign companies from Australia, Canada, and China, however, which began their mineral exploration projects in Vietnam in the early 1990s, had discovered some economic resources of bauxite, copper, fluorspar, gold, nickel, and tungsten during the past 2 years. These foreign companies, which continued and intensified their exploration activities in 2004 by conducting feasibility studies for the development of those mineral resources, were expected to move into the production phase by 2008 or 2009.

In 2004, Vietnam's economy as measured by real GDP grew by 7.7% compared with 7.3% in 2003. The higher economic growth in 2004 was the result of a 12.9% increase in private consumption and a 24.6% increase in total investment. On the supply side, the industry sector, which included construction, manufacturing, mining, and utilities, grew by 10.2% compared with 9.6% in 2003. The country's inflation rate, however, was 7.7% compared with 3.2% in 2003 (Asian Development Bank, 2005§; Vietnam Panorama, 2005§).

The output of the mining and quarrying sector contributed 6.1% to Vietnam's GDP in 2003 (the last year for which data were available). In 2003, the output value of the mining and quarrying sector at 1994 constant prices was estimated to be $1.32 billion, and Vietnam's GDP at 1994 constant prices was estimated to be $21.66 billion (Asian Development Bank, 2004§).

Despite a 29% growth in exports owing to an increase in export earnings of crude petroleum and coal, Vietnam incurred a merchandise trade deficit of about $5.8 billion because of the large imports of fertilizers, refined petroleum products, and steel. The country's imports and exports were estimated to be $31.8 billion and $26 billion, respectively, in 2004. In minerals trade, Vietnam was a net importer of minerals owing to its large import bills for refined petroleum products ($3.6 billion), crude steel and steel products ($2.5 billion), and manufactured fertilizers ($870 million). Vietnam's major exports of mineral commodities were crude petroleum, which was valued at $5.7 billion, and coal, valued at $319 million in 2004 (Vietpartners.com, 2005a§).

Commodity Review

Metals

Bauxite and Alumina and Aluminum.—To develop the bauxite resources in Vietnam, BHP Billiton Aluminium of Australia reportedly established a representative office in Hanoi to manage the assessment of a $1.6 billion bauxite mine and aluminum refinery project in the Dak Nong District in the Central Highlands Province of Dak Lak. The proposed $1.6 billion project would include the development of a bauxite mine, transportation infrastructure, and an aluminum refinery. Earlier in September 2003, BHP Billiton Aluminium submitted a proposal to the Ministry of Industry and offered to cover all expenses for conducting the comprehensive studies on bauxite reserves in the Central Highlands where bauxite resources were estimated to be the world's second largest and accounted for 16.5% of the world's total (Vietnam News, The, 2004a§).

Chromium.—Production of chrome ore was estimated to have continued its upward trend. The sharply higher estimated production of chrome ore in 2003-04 was based on increased exports to China, which imported 143,520 metric tons (t) of chrome ore from Vietnam in 2003 and 194,910 t in 2004 (Tex Report, The, 2005). In 2002, the Government announced a list of industrial projects that would require foreign investment; these included a mining project to develop a mine and a processing plant in Thanh Hoa Province to produce 250,000 metric tons per year (t/yr) of chrome ore either by joint venture or by a 100% foreign-owned company. No new chrome mine development, however, was reported in 2003 or 2004. A placer deposit, which is situated in a shallow layer covered by thin soil burden near Nui Mua Mountain, is located about 20 kilometers (km) from Than Hao City in Thanh Hao Province. Ore reserves at this deposit were estimated to contain about 20.8 million metric tons (Mt) of Cr_2O_3 (Trong Duc Chinh, 2002§).

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[1] References that include a section mark (§) are found in the Internet References Cited section.

Copper.—In February, the Government reportedly allowed China Nonferrous Metal Industry Engineering and Construction Co. Ltd. and the state-owned Vietnam Industrial Construction Corp. to form a consortium to build the country's first copper mine and smelter complex. The state-owned Vietnam National Minerals Corp. (VIMICO), which was the investor in the complex, began ground work on the site of a $65 million copper mine and smelter complex at Sin Queyen in the Province of Lao Cai in September 2003. The construction work reportedly was scheduled for completion in late 2004, and a test run was to be held during the first quarter of 2005. Operations would begin in the second quarter of 2005. The mining and milling complex would have a capacity to mine and process from 1.1 to 1.2 million metric tons per year (Mt/yr) of ore to produce 42,000 t/yr of copper concentrate with an average metal content of 25% copper, 110,000 t/yr of iron ore concentrate, and about 20,000 t/yr of sulfur as coproducts. The smelter and refinery would have the capacity to produce 10,500 t/yr of refined copper. The smelter and refinery byproducts would include 340 kilograms per year (kg/yr) of gold, 145 kg/yr of silver, and 40,000 t/yr of sulfuric acid. The complex was expected to operate for about 40 years at planned ore output of 1.2 Mt/yr with estimated ore resources of 50 Mt. According to VIMICO, the project would be financed by more than $40 million in soft loans from the Export-Import Bank of China. VIMICO would provide the remaining $12 million (Vietnamtrade.org, 2003§; Yahoo.com, 2004§).

Gold.—In 2004, gold exploration was mainly by Olympus Pacific Minerals Inc. of Canada at Bong Mieu and Phuoc Son in Quang Nam Province. Other foreign companies, such as Archipelago Resources PLC of the United Kingdom in Cam Thuy-Ba Thuoc District, Kim Binh Zinc Co. Ltd. of China in Lang San Commune of Na Ri District, and Anh Kim Joint Venture Co. of Malaysia in Ea Ba Commune of Phu Yen Province reportedly were actively exploring for gold in 2004.

Olympus Pacific Minerals, which acquired the Bong Mieu gold property in 1997, began field work on the property during the second half of 2003. The Bong Mieu property, which covers about 30 km², is located about 80 km south of Danang in Quang Nam Province in central Vietnam. The property has three gold deposits at Ho Gan, Ho Ray, and Nui Kem. The Bong Mieu gold property was 80% owned by Olympus Pacific Minerals Inc. and 20% owned by the company's Vietnamese partners. In July, Olympus Pacific Minerals retained Micon International Ltd. to conduct a scoping study to develop an open pit mine at the Ho Gan deposit. Micon International was to conduct prefeasibility and feasibility studies for the development of Bai Dat and Bai Go underground deposits of the Phuoc Son Project (Olympus Pacific Minerals Inc., 2004c§).

In November, Olympus Pacific Minerals announced the results of the positive independent prefeasibility study completed by Micon International for the Ho Gan open pit. According to Olympus Pacific Minerals, a detailed environmental impact statement (EIA) was completed by Kingett Mitchell Ltd. of New Zealand, and a mining license for the Ho Gan deposit was issued. The project was expected to start production during the second quarter of 2005. The initial mining operations for the first 7 months would be at a rate of 500 metric tons per day (t/d) of ore; after that, it would increase to 800 t/d. As of November 2004, the estimated ore reserves for the Ho Gan deposit included 189,200 t of proven reserves at a grade of 2.74 grams per metric ton (g/t) gold and 668,800 t of probable reserves at a grade of 2.32 g/t gold (Olympus Pacific Minerals Inc., 2004b§, d§)

The Phuoc Son gold property, which covers about 70 km², is located 90 km southwest of Danang in Quang Nam Province. The project area has more than 30 gold prospects; of these prospects, the Dak Sa and the Northern sectors are the most advanced. The Phuoc Son gold project was 85% owned by Olympus Pacific Minerals and 15% owned by Mien Trung Industrial Company, which was controlled by the local Provincial Government. In July, Micon International was retained by Olympus Pacific Minerals to conduct studies at Dak Sa to determine the feasibility of developing an underground mine with pilot-scale gold production from the Bai Bat and the Bai Go deposits. According to Olympus Pacific Minerals, the EIA report for the Dak Sa underground mine had been approved by the Ministry of Resources and Environment in December. The approval of the EIA was a precondition for approval of a mining license application in Vietnam. As of January 2004, measured and indicated mineral resource estimates for the Bai Dat and the Bai Go deposits totaled 318,000 t at a grade of 14.32 g/t gold (Olympus Pacific Minerals Inc, 2004a§).

Iron and Steel.—Iron ore was produced from the Trai Cau Mine in the Province of Bac Tai, the Na Lung Mine in the Province of Cao Bang, and the Thach Khe Mine in the Province of Nghe Tinh. Iron ore production increased gradually from 300,000 t in 2000 to 430,000 t in 2002 and reached 540,000 t in 2003. Iron ore production in 2004 was estimated to be 650,000 t. In 2003, about 200,000 t was exported to China, and the remainder was consumed by state-owned Thai Nguyen Iron and Steel Co. and other domestic pig iron producers. To meet the raw material requirement of the expanding crude steel production capacity of Thai Nguyen Iron and Steel, the Government planned to expand the capacity of the Thach Khe Mine, which contains more than 500 Mt of proven reserves at a grade of between 60% and 65% iron (United Nations Conference on Trade and Development, 2004; Intellasia.com, 2004§).

During 2004, state-owned Vietnam Steel Corp. (VSC) was in talks with Kunming Iron and Steel Group Co. of Yunnan Province in China to develop jointly the Quy Xa iron ore deposit in Lao Cai Province; the deposit is located about 340 km northwest of Hanoi. According to an onsite study completed by Kunming Iron and Steel, the Quy Xa deposit contains about 120 Mt of ore reserves with a typical iron content of between 30% and 50%. An agreement was expected to be signed by early 2005. According to company officials, Kunming Iron and Steel was expected to provide capital, technology, and equipment for mine development. Most of the iron ore production would be exported to Kunming Iron and Steel. The total capital was estimated to be in the range of $50 million, and construction was scheduled to start in the second half of 2005 (Huaye Iron & Steel Group, 2004§).

Vietnam's steel industry continued to have an imbalance between upstream (production of crude steel) and downstream (rolled steels) in 2004. Domestic crude steel production was by three subsidiaries of VSC (Danang Steel Company, Southern Steel Co., and Thai Nguyen Iron and Steel) and a private billet producer (Hoa Phat Company). Hoa Phat Steel began its crude steel (billet) plant with a 200,000-t/yr capacity at the Pho Noi Industrial Park in Hung Yen Province in July 2004 (VietnamNet Bridge, 2004b§).

To meet the domestic requirements for crude steel (in the form of billet or ingots) in 2004, Vietnam imported 2.3 Mt of crude steel (billet) valued at $870 million (Vietpartners.com, 2005b§).

To reduce the country's reliance on imports of crude steel, VSC planned a $3.5 billion project to develop the Thack Khe iron ore mine and an integrated steel complex in Ha Tinh Province. The Thack Khe iron ore deposit, which is located about 300 km south of Hanoi, contains 544 Mt of ore reserves. Sun Steel Corp. was expected to provide $80 million for the development of the iron ore mine. The complex was slated to have a capacity of 4.5 Mt/yr of crude steel, 4 Mt/yr of hot-rolling capacity, and 800,000 t/yr of cold-rolling capacity. According to the Ministry of Industry, the project's prefeasibility study was awaiting approval by the Prime Minister and the National Assembly in November 2004 (Southeast Asia Iron and Steel Institute, 2004a§, b§).

In May 2004, Sun Steel Corp. reportedly started the three-stage construction of a new steel billet plant in Nhon Trach District, Dong Nai Province; it is located about 32 km northeast of Ho Chi Ming City. The first stage of construction, which was expected to be completed in mid-2006, involved installation of a 1,000-cubic-meter furnace with a 1-Mt/yr-capacity billet plant, which would use scrap as its raw material. The project would increase the plant capacity to 2 Mt/yr after the second-stage construction is completed in 2007 and to 3 Mt/yr after the third-stage construction is completed in 2008 (South East Asia Iron and Steel Institute, 2004b§-d§).

To lower the prices of steel products in the local markets, the Ministry of Finance reduced its import tariffs on steel products to 10% from between 15% and 20%, and on steel ingot, to 5% from between 5% and 10% in August 2004 (U.S.-ASEAN Business Council, 2004§).

Nickel.—Through its wholly owned subsidiary AMR Nickel Ltd., Asian Mineral Resources Ltd. (AMR) of New Zealand continued to explore for copper and nickel in its 70% owned Ban Phuc Nickel property in the 150-km^2 Ta Khoa concession, which is located about 180 km west of Hanoi in the Province of Son La. Phase I of the feasibility study was begun, and exploration for copper and nickel continued in the concession area in 2004. The feasibility study was expected to be completed by mid-2005.

During 2004, AMR completed the drilling of 73 holes for a total of 13,661 meters in a program designed to explore resource extensions and infill the main Ban Phuc nickel deposit. The 2004 drilling program confirmed the grade and width of the massive sulfide mineralization and allowed a much more accurate estimation of recoverable resources (Asian Mineral Resources Ltd., 2005b§).

The revised resources estimate at the Ban Phuc deposit included indicated resources of 10.86 Mt at grades of 0.82% nickel, 0.16% copper, and 0.02% cobalt; and inferred resources of 6.33 Mt at grades of 0.58% nickel, 0.05% copper, and 0.01% cobalt. Total massive nickel-copper sulfide resource estimates included indicated resources of 1.31 Mt at grades of 2.56% nickel, 1.06% copper, and 0.09% cobalt; and inferred resources of 200,000 t at grades of 2.62% nickel, 1.25% copper, and 0.09% cobalt (Asian Mineral Resources Ltd., 2005a§).

In 2004, AMR signed a memorandum of understanding (MOU) with state-owned Mineral Development Co. Ltd. to acquire an additional 20% interest in the Ban Phuc project. The remaining 10% interest was held by Son La Engineering and Construction Co. Ltd., which was owned by the Son La Provincial Government (Mining Journal, 2004).

Tungsten.—In 2004, Tiberon Minerals Ltd. of Canada continued to explore for tungsten, fluorite, and associated bismuth, copper, and gold at the Nui Phao polymetallic property, which is located about 80 km north of Hanoi in Thai Nguyen Province.

In February, the Government, through the Ministry of Planning and Investment, granted an investment license to Nui Phao Mining Joint Venture Co. Ltd. (NPMJVC) for the Nui Phao project. NPMJVC was owned by Tiberon Minerals (70%), and Thai Nguyen Export-Import Investment Co. and Thai Nguyen Minerals Company (15% each).

The key provisions of the license include the following:

- An initial 30-year term with the provision for a 20-year extension;
- Exclusive right to mine and explore in a 54.66 km^2 area that covers the Nui Phao deposit, the renewed Nui Phao exploration license area, and the Cu Van exploration area;
- A favorable corporate tax rate and other incentives. Under the existing Foreign Investment Law, NPMJVC will receive a 3-year corporate tax holiday after achieving profitability followed by an 8-year period in which the corporate tax rate would be reduced by 50%. The corporate tax rate without any incentives would be 15% during the first 12-year period; thereafter, the rate would be 28% before any tax incentives;
- The royalty rates would be 5% for tungsten, 3% for bismuth and copper, and 2% for gold and fluorspar.

NPMJVC reportedly was in the process of applying for a mining license to develop the Nui Phao deposit (Tiberon Minerals Ltd., 2004e§).

In March, Tiberon Minerals acquired an additional 7.5% interest in the Nui Phao project for about $3.1 million from Thai Nguyen Export-Import Investment and increased its total interest in the project to 77.5%; Thai Nguyen Export-Import Investment reduced its interest to 7.5% from 15%. According to the President of Tiberon Minerals, of the total $3.1 million purchase price, $2.6 million would be contributed directly to the Nui Phao project in accordance with the project development and construction schedule (Tiberon Minerals Ltd., 2004d§).

In April, Tiberon Minerals announced that it had appointed the Aker Kvaerner E&C Division of Aker Kvaerner Canada, Inc. as the lead engineering consultant on the Nui Phao bankable feasibility study. Tiberon Minerals anticipated that the feasibility study could be completed by yearend 2004. In August, Tiberon Minerals signed a Mandate Letter that appointed Fortis Bank S.A./N.V. and WestLB AG to act as exclusive structuring banks and lead arrangers for the $100 million debt financing of the Nui Phao project. In November, Tiberon Minerals signed an MOU with Sidech S.A. of Belgium for purchase of all Nui Phao's bismuth output (approximately 1,000 t/yr) for the first 5 years of production (Tiberon Minerals Ltd, 2004a§-c§).

Industrial Minerals

Cement.—Cement production continued the 2003 upward trend because of the continued growth in the domestic demand for cement. In 2004, cement production increased by 8.8% to 25.3 Mt, and cement consumption increased by 10% to 25.8 t. To meet the growing demand and to stabilize the domestic cement market, Vietnam's cement industry imported 3.9 Mt of clinker and 2.3 Mt of cement in 2004. According to an estimate by the Government, Vietnam's demand for cement will reach 28.4 Mt in 2005, 46.8 Mt in 2010, 62.5 Mt by 2015, and 70 Mt by 2020 (Vietpartners.com, 2004c§, g§).

In 2004, state-owned Vietnam National Cement Corp. (VNCC) warned that the industry might face a cement shortage of up to 6.5 Mt in 2005, which was based on the estimated demand of 29.1 Mt and projections that the cement production in 2005 might drop to about 22.6 Mt. During the past 2 years, cement demand had increased by 4.5 Mt/yr because of the rapid urbanization, while production capacity increased by only 2.5 Mt/yr. To meet the demand for cement projected for 2005, the Ministry of Construction urged the industry to draft a plan to import more clinker and speed up the pace of construction on cement projects (Vietpartners.com, 2004b§).

In 2004, VNCC's 10 new cement projects with a combined total capacity of 17.2 Mt/yr were behind schedule; some of the projects were 3 years behind schedule because of financial and site-clearance problems. By yearend 2004, VNCC brought onstream the 1.4 Mt/yr-capacity Tam Diep cement plant in the Province of Ninh Binh. VNCC had to speed up construction of the Hai Phong Cement plant, which had been scheduled to be completed by 2005. Two cement projects were behind schedule because of redesigns and increased costs of building materials at the cement plant. Seven other cement projects started in 2004 by VNCC included the expansion projects at its Binh Phouc, But Son, Ha Tie II-2, and Hoang Thach plants and three clinker-grinding plants in Ho Chi Minh City, Khanh Hoa, and Long An (Vietnameconomy.com, 2004a§).

Other projects initiated in 2004 included the $74 million 910,000-t/yr cement plant in the Province of Yen Bai by the Yen Bai Cement Joint Stock Company (YCJC); the $64 million 910,000-t/yr Hung Vuong plant in Thanh Ba District in the Province of Phu Tho by the joint venture of Housing and Urban Development Corp., Phu Tho Cement Company, and Vietnam Machinery Installation Corp.; the $162 million project to double the 1.4-Mt cement plant near Hai Phong by Hai Phong Chinfon Cement Company; and the $249 million project to raise the capacity to 4.3 Mt/yr from 2.15 Mt/yr by Nghi Son Cement Corp. (Vietnameconomy.com, 2004b§;Vietpartners.com, 2004d§-f§).

In October, Lafarge SA announced that it planned to invest $30 million to build a 500,000 t/yr cement grinding plant, which is located 20 km southeast of Ho Chi Minh City in the Province of Dong Nai. The investment was to be made by the DonaFrance joint venture, in which Lafarge owned 70% interest. The plant was scheduled for completion in late 2005 (MEi Online, 2004§).

Graphite.—In January, an MOU was signed by the Quang Ngai Provincial Government and Nobel Oil Company of Russia for the development of a graphite mine in the Son Tinh District of Quang Ngai Province. Immediately after the agreement was signed, an investment license for graphite production was issued to the joint venture. According to the agreement, the joint venture would have a capital cost of $3.3 million, and the mine capacity would be 5,000 t/yr of graphite. According to the Provincial Government, graphite resources in the Province were estimated to be 4 Mt, of which about 2.5 Mt was exploitable (Quang Ngai, 2004§; Vietnam News, The, 2004c§).

Mineral Fuels

Coal.—The Vietnamese coal industry had a very successful year in 2004 owing to increased domestic demand and higher exports. Coal production reached a record level of about 26 Mt in 2004 compared with 19.6 Mt in 2003. In 2004, coal exports rose to 11.6 Mt from 7.2 Mt in 2003 and export prices were between 20% and 50% higher than those of 2003 (Vietnameconomy.com, 2005a§, b§; Vietnam-ustrade.org, 2005§).

Increased domestic demand for coal in 2004 was mainly the result of increased demand for the generation of electricity and the manufacture of fertilizer and cement. The Ministry of Industry forecasted that the domestic demand for coal in 2005 will reach to between 12 and 13.5 Mt, of which about 5.5 Mt will be for power generation; 2.5 Mt, for cement production; and 700,000 to 800,000 t, for fertilizer production. The coal industry was expected to produce between 27 and 29 Mt in 2005 (Vietnameconomy.com, 2005b§; Vietnamtradepoint.com, 2005§).

Vietnam National Coal Corp. (Vinacoal) controlled most of the mining, distribution, and export of coal. Most of the coal produced in Vietnam was anthracite mainly from Quang Ninh Province in northeastern Vietnam. In 2004, the Coc Sau Mine, which was the leading coal mine, produced about 2.4 Mt and the Cua Ong Mine, which was the leading coal preparation plant that used Australian equipment, produced about 4.4 Mt of clean coal. According to Vinacoal, in addition to the exisiting coal preparation plants, three new coal preparation plants will be built in Khe Cham, Lap My, and Uong Bi Districts in Quang Ninh Province (Vietnameconomy.com, 2005a§).

Other major coal mines were in the Cam Pha, the Cao Son, the Deo Nai, the Dong Trieu, the Ha Tu, the Hon Gai, the Mao Khe, and the Mong Duong Districts. Coal preparation plants were at Nam Cau Tran in Ha Long City and Vang Danh in Uong Bi District. Production of brown coal was mainly from the Na Duong Mine, which is located in the Province of Lang Son. In March 2003, a significant coal bed was discovered in the Red River Delta region in the northern part of the country. Vinacoal planned to use the reserve for thermal powerplants. In October 2004, Vinacoal reportedly was in talks with Fujan Province Coal Industry Corp. of China to develop jointly the Bac Coc Sau Mine in Quang Ninh Province (U.S. Energy Information Administration, 2005§).

In 2004, Vietnam's coal exports totaled 11.6 Mt at prices that ranged from $26 to $30 per metric ton and were estimated to be about $340 million. These exports went mainly to China, Japan, the Republic of Korea, Thailand, and Western European countries (VietnamNet Bridge, 2004a§).

Natural Gas and Petroleum.—Natural gas was produced by VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubeznheft of Russia) from the small onshore Tien Hai C Gasfield in the Hanoi Trough (part of the Song Hong Basin). Associated gas was produced by VietSovPetro from the larger offshore Bach Ho (White Tiger) and Rang Dong (Dawn) oilfields, which are located in the Cuu Long Basin. A consortium led by BP p.l.c. of the United Kingdom produced associated gas from the offshore Lan-Tay gasfield in the Nan Con Son Basin. In 2004, natural gas production increased by 81.2% to 6.25 billion cubic meters and averaged about 17.12 million cubic meters per day (Vietpartners.com, 2005b§).

In the domestic market, natural gas was consumed as fuel by powerplants and as raw materials by a nitrogen fertilizer plant in the Phu My Industrial Zone in the Province of Ba Ria-Vung Tau; the remainder was consumed as raw material by the liquefied petroleum gas (LPG) and condensate processing plants at Dinh Co for the production of LPG and gasoline in Vung Tau in the Province of Ba Ria-Vung Tau.

BP p.l.c. and its partners, ConocoPhillips Company of the United States and Oil and Gas Company of India, were expected to increase their annual gas deliveries to another partner (Petro-Vietnam) to 2.65 billion cubic meters per year or 7.26 million cubic meters per day in 2004 from 1 billion cubic meters per year or 2.73 cubic meters per day, in 2003. In November 2002, BP, ConocoPhilips, and Oil and Gas Company began their gas deliveries from the Lan Do and the Lan Tay gasfields in Nam Con Son Basin to PetroVietnam for power generation and nitrogen fertilizer production via a 399-km pipeline to Phu My Industrial Zone. BP, which had invested about $800 million in the $1.3 billion Nam Con Son Project, planned to produce 3 billion cubic meters of natural gas between 2005 and 2007 and 7 billion cubic meters per year of natural gas after the Hai Thach and the Lan Do gasfields become operational in 2007. The pipeline had the capacity to deliver up to 7 billion cubic meters per year of natural gas (Vietnam News, The, 2004b§; Vietpartners.com, 2004a§, 2005a§).

Crude petroleum was produced by PetroVietnam in joint venture with partners from Canada, France, Japan, Malaysia, Russia, Sweden, and the United States. According to the General Statistical Office, Vietnam produced 20.17 Mt, or an average of 391,400 barrels per day (bbl/d), of crude petroleum in 2004. It exported virtually all of its crude petroleum output and earned $5.6 billion of foreign currency in 2004 (Vietpartners.com, 2005a§).

In 2004, crude petroleum was produced from seven offshore oilfields in three basins—the Bach Ho, the Rang Dong, the Rong, the Ruby, and the Su Tu Dean in the Cuu Long Basin; the Bunga Kekwa in the Malay-Tho Chu Basin, which is located off the southern coast of Vietnam between Vietnam and Malaysia; and the Dai Hung in the Nam Con Son Basin. The output from the Bunga Kekwa was shared equally by Malaysia and Vietnam. Several large oilfields and gasfields in the Cuu Long Basin were brought onstream in early 2004 by ConocoPhillips and Canada's Talisman Energy Inc. These fields included the Su Tu Den (Black Lion) at the rate of 85,000 bbl/d and the Bunga Kekwa in Blocks PM-3 CAA and 46-Cai Nuoc at the rate of 60,000 bbl/d (Thanh Nien News, 2004§).

Korea National Oil Corp. (KNOC), which announced the discovery of oil and gas in Block 11-2 field in the Nam Con Son Basin in late 2003, began construction of oil and gas production facilities off the coast of southern Vietnam in 2004. According to KNOC, the area contains recoverable reserves of about 34 billion cubic meters of natural gas and 38 million barrels of condensate. The construction of the offshore oil and gas production facilities, which was started in March 2004 with an estimate cost of $300 million, was scheduled for a test run in mid-2005 before commercial operation was to begin in November 2005 (Petroleum Economist, 2004).

Outlook

For the next 4 to 5 years, the country's mining sector will continue to be dominated by the coal and oil and gas industries. In the energy sector, the coal and oil and gas industries were expected to increase their capacity in the next 2 to 4 years. The mining sector also is expected to expand. Exploitation of such minerals as bauxite, copper, fluorspar, gold, iron ore, tungsten, and zinc is expected to add new capacity to the mining sector following the completion of joint-venture development projects with companies from Australia, Canada, and China. Development of new capacity for the production of copper, gold, and zinc is expected to be completed between 2005 and 2006. Development of new capacity for the production of fluorspar, iron ore, nickel, and tungsten could be completed by 2007, but new capacity of bauxite may take longer. The existing capacity for production of cement is expected to be expanded by more than 17 Mt/yr in the next 3 to 5 years to meet the growing demand for cement as a result of Vietnam's rapid urbanization.

Vietnam's economy is expected to continue to grow at a slightly slower pace than that of 2004 in the next 2 years. According to a forecast by the International Monetary Fund, Vietnam's GDP is projected to grow by 7.2% in 2005 and by 7.0% in 2006 (International Monetary Fund, 2005§).

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General Statistics Office, Hanoi, Vietnam: Statistical Yearbook, annual.

TABLE 1
VIETNAM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2000	2001	2002	2003	2004[e]
Barite[e]		52,500	71,100	60,300	81,500	101,000 [3]
Cement, hydraulic	thousand metric tons	13,298	16,073	21,121 [r]	23,282	25,320 [3]
Chromium ore, gross weight		76,300	70,300	80,000 [r, e]	120,000 [r, e]	150,000
Clays, kaolin[e]		520,000	600,000	600,000	650,000	650,000
Coal, anthracite	thousand metric tons	11,609	13,397	16,347	19,590 [r]	26,820 [3]
Copper concentrate, gross weight[e]		2,400 [r]	1,600 [r]	1,100 [r]	1,200 [r]	1,500
Fluorspar[e]		3,000	3,000	3,000	3,000	3,000
Gas, natural, gross	million cubic meters	1,598	1,724	2,260	3,450	6,250 [3]
Gold[e]	kilograms	3,000	3,000	2,000	2,000	2,000
Iron ore[e]		300,000	400,000	430,000	540,000	650,000
Ilmenite, gross weight[e]		174,000	180,000	180,000	200,000	200,000
Lead, mine output, Pb content[e]		1,200	900	1,100	1,100	1,100
Lime	thousand metric tons	1,156	1,351	1,426	1,450 [e]	1,500
Manganese concentrate, gross weight[e]		65,000	67,000	68,000	68,000	70,000
Nitrogen, N content of ammonia		41,900	52,600	58,400	79,700	216,200 [3]
Petroleum, crude	thousand 42-gallon barrels	115,373	119,212	117,753	125,281	142,844 [3]
Phosphate rock:						
Gross weight	thousand metric tons	785	677	680	823 [r]	800
P_2O_5 content	do.	236	204	204	247 [r]	240
Pyrite, gross weight[e]	do.	200	300	400	450	450
Pyrophyllite[e]		30,000	30,000	30,000	30,000	30,000
Sand and gravel	thousand metric tons	83,200	92,200	95,000	98,000 [e]	98,000
Salt	do.	590	669	1,089 [r]	1,275 [r, e]	1,300
Silica sand[e]	do.	60,000	62,000	62,000	63,000	63,000
Steel:						
Crude	do.	306	319	409	544	658 [3]
Rolled	do.	1,583	1,914	2,503 [r]	2,682	2,950 [3]
Stone, building stone	do.	57,600	80,400	83,700	85,000 [e]	90,000
Sulfur[e]		22,000	22,000	22,000	22,000	22,000
Tin:[e]						
Mine output, Sn content		1,800 [r]	1,700 [r]	1,700 [r]	2,100 [r]	3,500
Metal, smelter		1,800	1,700 [r]	1,700 [r]	2,100 [r]	3,500
Zinc, mine output, Zn content[e]		12,500	32,000 [r]	42,000 [r]	45,000 [r]	40,000
Zirconium, gross weight[e]		7,000 [r]	8,000 [r]	11,000 [r]	13,000 [r]	13,000

[e] Estimated; estimated data are rounded to no more than three significant digits. [p] Preliminary. [r] Revised.

[1] Table includes data available through June 24, 2005.

[2] In addition to the commodities listed, bauxite, bentonite, refractory clay, construction aggregates, gemstones, granite, graphite, iron ore, marble, and rare earths were mined, but not reported. Available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

Sources: Vietnam's General Statistics Office, Statistical Yearbook, 2002; British Geological Survey, World Mineral Statistics, 1999-2003; World Metal Statistics, May 2005; South East Asia Iron and Steel Institute, Crude Steel Production, Annual Statistics, 1994-2003; U.S. Geological Survey Minerals Questionnaire, 2000; The Barytes Association, World Barytes Production 2000-04; International Lead and Zinc Study Group, Lead and Zinc Statistics, Monthly Bulletin of the International Lead and Zinc Study Group, May 2005.

TABLE 2
VIETNAM: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operation companies and major equity owners	Location of main facilities	Annual capacity
Cement		Chinfong Hai Phong Cement Corp. (Chingfong Group of Taiwan, 70%; Hai Phong Municipal Government,15.56%; Vietnam National Cement Corp., 14.44%)	Min Duc near Hai Phong City	1,400
Do.		Morning Star Cement Ltd. (Holcim Group of Switzerland, 65%, and Vietnam National Cement Corp.—Ha Tien I, 35%)	Hon Chong, Kien Giang Province	2,300
Do.		Nghi Son Cement Corp. (Taiheiyo Cement Corp. and Mitsubishi Materials Corp. of Japan, 65%, and Vietnam National Cement Corp., 35%)	Nghi Son, Thanh Hoa Province	2,150
Do.		Vietnam National Cement Corp. (100% state-owned)	Bim Son, But Son, Da Nang, Ha Tien I, Ha Tein II, Hai Phong, Hai Van, Hoang Mai, Hoang Thach, and Tam Diep	13,500
Chromite		Thai Nguyen Nonferrous Metal Co. (wholly owned subsidiary of state-owned Vietnam National Minerals Corp.)	Nui Nua, Thanh Hoa Province	200
Coal, anthracite		Vietnam National Coal Corp. (100% state-owned)	Cam Pha, Cao Son, Coc Sau, Vang Danh, Dong Trieu, Ha Lam, Ha Tu, Hong Gai, Khe Cham, Mao Khe, Mong Duong, Cua Ong, Uong Bi in Quang Ninh Province	26,000
Fertilizer:				
Apatite		Vietnam National Chemical Corp. (100% state-owned)	Lao Cai, Lao Cai Province	700
Superphosphate		do.	Lam Thao, Phu Tho Province	800
Gas, natural	million cubic meters per day	VietSovPetro (a joint venture of Vietnam Oil and Gas Corp. and Zarubeznheft, a Russian oil company), and a joint venture of PetroVietnam, BP p.l.c. of the United Kingdom, Oil and Natural Gas Co. of India, and ConocoPhiliips Co. of the United States	Offshore Bach Ho Oilfield, Rang Dong Oilfield, and Lan-Tay Do Gasfield	17
Iron ore		Vietnam Steel Corp.	Trai Cau, Bac Tai Province; Na Lung, Cao Bang Province; and Thack Khe, Nghe Tin Province	700
Nitrogen, ammonia		Vietnam National Chemical Corp.	Ha Bac, northern Vietnam Phu My, Ba Ria-Vung Tau Province	375
Petroleum, crude	thousand 42-gallon barrels per day	VietSovPetro	Offshore Bach Ho, Rong, Rang Dong, Ruby, Bunga Kekwa, Dai Hung, and SuTu Trang Oilfields	390
Salt		Vietnam National Salt Corp.	Nam Dinh, Nghe An, and Hai Tin Provinces	850
Steel, crude		Vietnam Steel Corp.	Cai Lan, Thai Nguyen Province, and Phu My, Ba Ria-Vung Tau Province	700
Tin:				
Concentrate		Cao Bang Nonferrous Metal Co. and Nghe Tinh Nonferrous Metal Co. (wholly owned subsidiaries of state-owned Vietnam National Minerals Corp.)	Pia Oac, Cao Bang Province; Quy Hop, Nghe An Province; and Tam Dao, Tuyen Quang Province	4
Refined		Thai Nguyen Nonferrous Metal Co.	Thai Nguyen, Bac Thai Province	4
Titanium, ilmenite		Bimal Minerals Co. Ltd. (Binh Dinh Minerals Co., 40%, and Malaysia Mining Corp. and Syarikat Pendorong Sdn. Bhd., 60%)	Cat Khanh, Qui Nhon, and Binh Dinh Provinces	70
Do		Ha Tinh Minerals and Trading Co.	Cam Hoa, Ky Annh-Cam, Xuyen, Ky Khan, and Ky Ninh, Ha Tinh Province	130
Do.		Mineral Development Co. No. 4 and No. 5 (wholly owned subsidiaries of Vietnam National Minerals Corp.)	Vinh City, Nghe An Province; Tuy Hoa, Dong Xuan in Phu Yen Province; and Quang Ngan, Vinh My in Thua Thien-Hu Province	50
Zinc, concentrate		Thai Nguyen Nonferrous Metal Co. (wholly owned subsidiary of Vietnam National Minerals Corp.)	Cho Dien, Bac Can Province	45